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Work on the Boston Subway was officially started on March 28 by Gov. Greenhalge and the Rapid Transit Commission in the presence of the principal officials of the city.

The Baltimore Belt Line tunnel, which was to have been opened to traffic by this time, is not yet ready. The delay is said to be in the overhead electrical equipments. May 1 is the date now set for the opening.

The Brooklyn Aldermen have passed a new trolley ordinance limiting the speed in that city to 8 miles an hour, as a maximum, with 6 miles per hour on parts of Fulton St., Myrtle Ave. and Broadway. All cars must stop, when called to do so, with the front platform at the near crossing of streets, and all cars must come to a full stop before crossing any intersecting railway.

The New York, New Haven & Hartford and the New York & New England railways deny that they are making any attempt to buy up competing trolley railways. But the Stamford & Stratford electric line has been lately purchased by a powerful New York syndicate, which seems to be after other roads in the vicinity. Just what connection there is between this move and the policy of the N. Y., N. H. & H. R. R., no outsider can yet say. In answer to certain statements of the steam railway companies, made to the Railway Committee of the Legislature, Judge Cager, attorney for the electric roads, said that 66% of the stock of these roads was held by citizens of Connecticut, while only 42% of the stock of the N. Y., N. H. & H. R. R. and 4% of that of the New York & New England was held by stockholders residing in the state.

A Boynton bicycle railway is projected on the Pacific coast, to run between Los Angeles and Santa Monica.

Work is progressing steadily on the Park Ave. viaduct of the New York Central R. R., in New York city. Where the old line was on a four-track masonry viaduct, a double-track trestle has been built on each side, and the masonry is now being torn down to make room for the new structure. Where the old line was in a cut, the tracks are still in service, but a large part of the steel viaduct has already been completed over it, the middle line of girders being temporarily supported by timber trusses spanning the cut. When the traffic has been transferred to the viaduct the central columns will be put in and the cut then filled in to the present street level, making a wide street, obstructed only by the three rows of columns of the four-track viaduct. At the Harlem River end a large traveler is used, which has four plate girders spanning the cut, and carried by legs running on temporary tracks on the street. The work was fully described and illustrated in our issue of May 25, 1893.

The most serious railway accident of the week was a head collision, April 2, near Bangor, Me., on the Maine Central R. R. A heavy westbound train, drawn by two engines, had orders to pass the eastbound express from St. John at Veazie, but no such order was given to the latter train, which usually has the right of way, but at this time was 90 minutes late. Both trains were running slowly. One of the firemen was killed under the wreck of the mail car, and four persons were injured.——A broken journal under a box car in a freight train on the New York, Lake Erie & Western R. R., near Elmira, N. Y., April 1, caused the derailment of three cars, including an oil tank car, which caught fire and six cars were burned. One man was killed.

A burned trestle near Portsmouth, O., on the Norfolk & Western R. R., gave way under a freight train on March 30, and 18 cars went down, the wreck being destroyed by fire.

An explosion of four boilers occurred April 1 at the Loring & Jones leather factory, Woburn, Mass., wrecking one end of the buildings and causing the fall of the smokestack. Five men were killed and five injured.

An electric car on the mountain line of the Lehigh Traction Co., at Janesville, Pa., ran away on the steep grade down the mountain March 30. Three persons were killed and 10 seriously injured by jumping from the car onto the rocks, and one was injured by broken timbers when the car jumped the track at the foot of the hill, and ran into a telegraph pole, being then overturned. The chain of the motorman's brake handle broke, but it is said that the car could easily have been stopped by the rear brake had not the passengers been panic-stricken and crowded out on the rear platform, so that the conductor could not apply the brake.

A serious fire occurred March 27 on Grand Ave., Milwaukee, Wis., between Third and Fourth Sts., involving a loss of over $1,000,000. The fire was in a busy commercial section of the city, and burned on both sides of the avenue.

Work on the erection of the seven story factory building at Dunning and Bedford Sts., New York city, was stopped March 25 by order of the Building Department. Work has been carried on during the winter, and the walls at the second and third stories began to bulge. The building is finished to the roof, and men were at work on the interior.

The dam of the Grass Valley Land & Irrigation Co.'s reservoir in Harvey's Gap, near Antler, Colo., gave way March 29, releasing a body of water 60 ft. deep covering an area of about 2 sq. miles. The flood caused considerable damage, and washed out parts of the Denver & Rio Grande R. R. and Colorado Midland R. R. The loss to the company is estimated at $50,000.

The subterranean waters of Long Island are to be investigated by the U. S. Geological Survey as soon as practicable. The thorough study and investigation of the saturated beds beneath this island will be of much importance in connection with the future water supply of that section, and especially of the city of Brooklyn. The proposed survey is said to be the result of the persistent efforts of Mr. Joseph Nimmo, Jr., of Suffolk County, ably seconded by Congressman J. W. Covert.

A successful test of 12-in. armor plate, at Bethlehem, Pa., on March 29, insures the acceptance of 650 tons of armor plate for the battle-ships "Oregon" and "Iowa." The plate tested was 21 × 7 ft. 3¼ ins., and 12 ins. thick, tapering to 7 ins. It weighed 71,500 lbs. and had the usual oak backing. Two Holtzer 250-lb. 8-in. shells were used. The first was a "cracking" shot, with 83½ lbs. of powder, and it struck the plate 35 ins. from the bottom and 15 ins. to the left of the center. The muzzle velocity was 1,678 ft. per second; the shell was shattered, with a penetration of 3 ins., and the point remained imbedded in the plate. No crack appeared. The "penetration" shot, with 111 lbs. of powder, left the gun with a velocity of 2,004 ft. per second. It penetrated the plate probably 7 ins., and was again shattered, and one narrow crack appeared. The back of the plate was not bulged, nor were any bolts started. The Ordnance Board pronounced the test the most successful yet made.

The new West Bluff sewer system for the city of Peoria, Ill., contracts for which will be awarded in April, as advertised in recent issues of this journal, comprises some exceptionally heavy work. The system drains about 1,000 sq. acres, requiring an outlet sewer from 64 to 88 ins. in diameter, 4,500 ft. long. This outlet sewer will be of brick, and, owing to the conformation of the ground, will require an excavation varying from 30 ft. to 45 ft. in depth its entire length. The system was designed by Mr. W. C. Parmley, First Assistant City Engineer, Peoria, Ill.

The annual inspection tour of the Junior electrical and mechanical engineering students of the University of Wisconsin, Madison, Wis., includes visits to the works of the Illinois Steel Co., Pullman Car Co., Siemens & Halske, Western Electric Co., Metropolitan Elevated Ry., Fraser & Chalmers, and the electric plant of the Auditorium hotel and theatre, all at Chicago; and then to the power house and works of the Pabst Brewing Co., the power house of the Milwaukee Street Ry. Co. and the central exchange of the Wisconsin Telephone Co., at Milwaukee, Wis.

A floating dry dock has been launched at Benicia, Cal., capable of holding a vessel of 3,000 tons. The dock is 300 ft. long and 95 ft. wide, and will cost $120,000 when fully equipped for service. San Francisco now has five dry docks, several of them large enough to handle the largest ocean steamer.

Hudson River navigation will be largely controlled in the interests of the New York Central & Hudson River R. R., officers of that company being largely interested in the newly-organized Hudson River Navigation Co., which is practically a reorganization of the company owning the People's Line of steamers running between New York and Albany. Two new fast steamers are to be built at a cost of about $1,500,000, and a material shortening of the time of the trip is anticipated. The new boats will not be ready this season.

A freight engine on the New York, New Haven & Hartford R. R. is reported as having hauled a train of 51 cars, with 1,000 tons of rails, from New York to Boston on March 26. The rails are for the Nantasket branch.

Burnt clay ballast is being used on the St. Louis extension of the St. Louis, Keokuk & Northwestern R. R. The material is a black, clayey soil or "gumbo," and the railway company contracts for it burned in the pit, the company laying the necessary tracks, furnishing the old ties and slack coal for burning, and loading and hauling the burned ballast. Mr. B. L. Crosby, the resident engineer, estimates that the ballast loaded on the cars at the pit costs from 65 to 70 cts. per cu. yd. Its cost has not usually been set so high, but Mr. Crosby thinks that in computing the cost, several small items are generally omitted, which he has included in his figures.

The burnt "black wax" soil ballast being used on the Texas Midland R. R. is said to cost $1 per cu. yd. in the track, and to have the advantage of being absorbent, so that in ordinary rainfalls most of the water is taken up by the ballast and does not go through to the roadbed.

The Loeber air-ship scheme has come to grief through the recent death of the "inventor," Charles G. Loeber, in New York. Stock was issued in most of the large cities, and numbers of subscribers were obtained, and the investors are now wondering whether the plant in possession of the relatives are of any value.

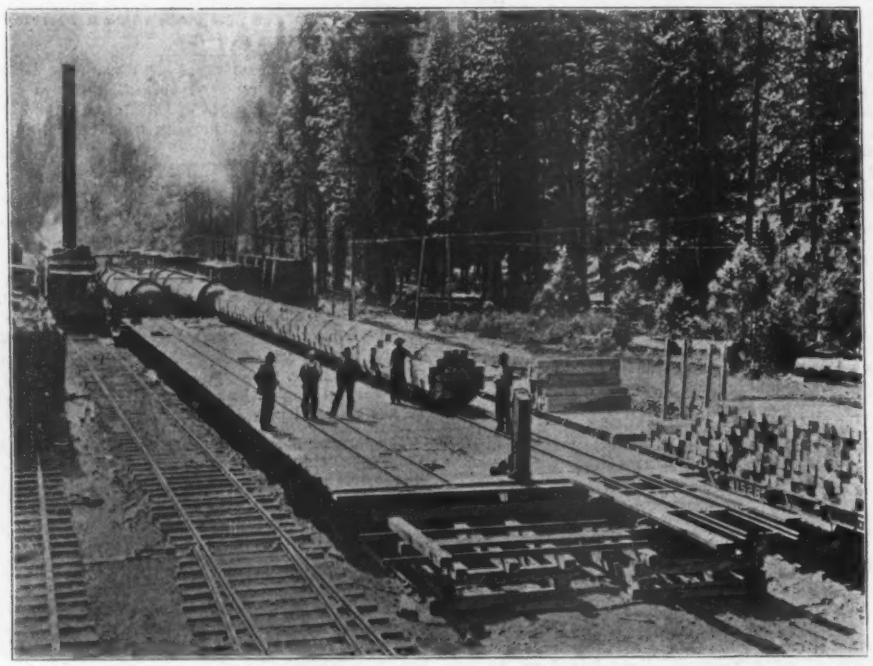
A flash-light tail lamp is reported as being tried on a freight caboose on the Grand Trunk Ry. A friction wheel driven by one of the car axles drives mechanism by which red and white flashes are shown alternately while the train is running ahead, red and green when it is backing and a steady red light when at rest. Such an apparatus would be somewhat costly, and its advantages are of comparatively little importance, while the probability of its being disarranged and so showing a wrong signal are apparently so great as to make the signal a dangerous rather than a safe appliance. It is said to be the invention of W. Hermann, of Cincinnati, O.

Steel ship building on the Great Lakes, especially at South Chicago, has a magnificent future, says the Chicago "Tribune." The Chicago yard now employs about 900 men, and five large vessels will be launched this spring. The owners of these yards look forward to speedily replacing the 1,000,000 tons of wooden ships now on the lakes with steel and iron; the tonnage of the iron and steel hulls on the Lakes does not yet exceed 200,000. The size of lake vessels is steadily increasing. Two of the steamships now building at Chicago will measure 380 ft. on the keel, 405 ft. over all, and be 48 ft. wide. They will carry 4,500 tons on 14½ ft. draft, and 6,000 tons on 18 ft. Two steel schooners are being built for the Minnesota Iron Co., guaranteed to carry 3,000 tons on 14½ ft. draft, the present limit of draft at Sault Ste. Marie. The general feeling of builders, however, is against sails, and the newer and larger vessels have the midship half of the hull clear of cabins or other obstructions. Light masts, fore and aft, serve rather as derricks than as sail-supporting sticks.

PORTABLE WOOD-PRESERVING PLANT; SOUTHERN PACIFIC RY.

At a recent meeting of the Technical Society of the Pacific Coast, a paper on the portable plant used by the Southern Pacific Ry. for preserving ties and timber on the lines of its Pacific system, was read by Mr. W. G. Curtis, Engineer of Maintenance of Way, to whom we are indebted for the accompanying view showing the plant in operation at Chestnut in northern California. The permanent plant for the Atlantic system of this road was described in our issue of April 26, 1894.

The portable plant was designed in order to treat timber at widely separated points of supply on the company's system, and thus save the time and expense of hauling ties to one permanent plant and back to the place of distribution, or the expense of establishing permanent plants at different points. The chief source of supply of ties for the Pacific Coast lines is the California redwood region. The redwood is very durable, but soft, and requires metal tie-plates to protect it from the cutting of the rail. The plate used was illustrated in our issue of May 25, 1893. For that part of the system lying in Nevada and Utah, and for the line from San Francisco to Portland, Ore., the most economical sources for ties are the pine and fir forests of southern Oregon and northern California, and it



PORTABLE WOOD PRESERVING PLANT; SOUTHERN PACIFIC RAILWAY.

(The View Shows the Plant as Arranged for Use at Chestnut, Cal.

is in this region that the plant here described is used. The plant is used for treating ties by the zinc-chloride or burnettizing system, and also for treating piles and timber with creosote.

The plant consists of a car fitted with two boilers, winding engine, tools, wire rope, etc.; a car carrying the superheater, measuring tank, force pump, air pump, circulating pump and condenser; two cars with three tanks of 4,000 gallons capacity for the preservative fluid, or 24,000 gallons in all; and two retorts or treating cylinders, each 114 ft. long and 6 ft. diameter. Each cylinder is made in two parts for transportation, connection for use being made by heavy flanged joints, and each part is mounted on a pair of car trucks, with a distance of 40 ft. c. to c. of truck pins. The trucks are fitted with hand and air-brakes, and a running board is laid along one side near the top. The complete plant, therefore, when ready for transportation, makes a train of eight cars. Means are provided for watching the progress of the treatment, so as to vary it to suit the requirements of the timber. The cylinders are provided with thermometers, the steam-heating pipes with a pyrometer, and all tanks have pressure gages, while the condenser has a measuring well, and the injection is pumped from a measuring tank. The condensing apparatus consists of a horizontal surface condenser supported upon a measuring well into which all condensing sap and vapor flow, this well being provided with a glass gage and being so proportioned that each foot of the gage represents ¼-lb. of water exhausted per cu. ft. of timber. The extraction of moisture is stopped when the rate, as shown by this gage, is reduced to 1 lb. of water per cu. ft. per hour.

In the arrangement of the temporary tracks, a slight grade is given the loading and unloading tracks for carloads of ties, so that cars may be conveniently moved by hand instead of requiring the continuous use of a locomotive at the plant. If the ties are for local distribution, a through track is laid alongside of each retort, the tank and machinery cars being placed on tracks outside of these first tracks. Flat cars of untreated ties are unloaded on the platform at the end of the cylinders, and while the charge is being treated the cars are pushed along to the platform at the other end, so as to be loaded with the treated ties which are run out at the further end of the cylinders. An extra flat car must be provided for each train-load of ties, as the increased weight of the ties makes it necessary to reduce the number loaded per car. If the ties are to be shipped to distant parts of the road, they are usually loaded in box cars after treatment, and in this case through tracks are not required, as the flat cars are unloaded at the first platform and then go back for another load, while the box cars are backed up alongside the other platform to receive the treated ties. This latter arrangement is shown in the photograph reproduced herewith. When the tracks are ready the cylinders are run into position, lined up, adjusted to the height of the platform by jackscrews, which form a part of the trucks, and then blocked up with steel wedges to take the weight off the springs. The flange joint of the two halves is then bolted up, and the middle trucks blocked, the end trucks being left free so as to act as expansion bearings. A platform as wide as the space covered by the two cylinders (which are side by side) is built at each end of the cylinders, being supported by tie blocking and made the same height as the tracks in the cylinders, so that the cradle trucks will run on tracks laid on the platforms. The tank cars and machinery cars are then run into position, and pipe connections made, all large pipe connections being made with ball and expansion joints. The smokestack is then raised and guyed, and the hauling winch placed at one end of the treating tracks, so that the engineman can see the position of the charge as he works the winch. The wire cable for handling the charges is run under the platforms from the winch to a snatchblock at each end of the platforms, thence returning along the top of the platforms.

For burnettizing ties, the solution contains 1.7% of pure zinc chloride, the mixture consisting of 34.46 lbs. of stock solution (43% chloride, 2% impurities, and 55% water) to 100 gallons of water. To allow for evaporation, a certain proportion of water is added during a continuous run, so as to prevent the solution from getting too strong, but it is not allowed to get below 1.7%. The fluid registers 2½° Beaume at 60° F., and is heated to 156° F. by steam coils in the tanks before being pumped into the cylinder. The ties are loaded on cradle trucks running on rails in the cylinders, and are piled in cylindrical form, with iron shims ¼ in. to ⅜ in. thick between each layer of ties, the whole being secured by chains. After the charge has been run in and the hemispherical ends of the cylinder are bolted up, a vacuum of 20 ins. is created, which requires about 10 minutes. Live steam at a pressture of 30 lbs. per sq. in., and with a temperature of about 260° F., is then admitted, and this pressure is continued for 4½ hours, when the steam is blown off, which requires 30 minutes. During these five hours the cylinder is kept drained. A second vacuum of 22 to 26 ins. is then created, and is maintained for about an hour. The cylinder is then filled with the solution, and pressure applied, which is continued until the required quantity of the solution has been injected into the ties. The surplus is then drawn off, the doors opened, the charge pulled out, and another charge run in. The maximum pressure with the zinc solution is about 140 lbs. per sq. in., but with freshly-cut ties it rarely exceeds 120 lbs.

The total time of treatment averages 8½ hours, and as the cylinders are worked nearly alternately, five charges are treated in 24 hours, or a total of 2,520 ties 7 × 8 ins. and 8 ft. long. With freshly-cut ties the time is reduced so as to get out six charges, or 3,024 ties, in 24 hours. The time required varies greatly with the kind of timber and the time of seasoning. California mountain pine, fir and spruce require less time than Oregon fir, and an Oregon fir tie seasoned for two years will take double the time required for a similar tie newly cut, while occasionally, with a close-grained, well-seasoned tie, the preservative fluid will not penetrate more than half an inch. Mr. Curtis states that all timbers are more readily treated when freshly cut, but the economy of such treatment may be questioned, for although some good authorities approve of the treatment of green timber by this particular process, it is generally considered advisable to season ties before treating them. This was pointed out in the description of the tie-preserving plant (Wellhouse system) of the Atchison, Topeka & Santa Fe Ry., at Las Vegas, N. Mex., in our issue of Sept. 13, 1894, in which it was stated that the ties would give better and longer service if allowed to season before treatment, and then to dry and harden before being put in the track. Mr. Kruttschnitt, General Manager of the Atlantic System of the Southern Pacific Ry., in describing the company's permanent creosoting and burnettizing plant at Houston, Tex. (Eng. News, April 26, 1894), stated that the percentage of absorption by seasoned ties will be much greater than the absorption of green ties. This would seem only reasonable, as the steaming and vacuum are not sufficient to extract the sap, but serve to open the wood cells to receive the preservative.

For test purposes borings are made from sample ties, and the ashes of these borings are analyzed to ascertain the quantity of zinc. The maximum quantity desired is 0.24 lb. of zinc per cu. ft. of timber. The tests usually show this full amount, the minimum being 21%, from the middle of the tie. The sample ties are plugged with creosoted sticks turned to a tight fit, and are then shipped with the rest.

The creosoting process is used for sawed timber, but principally for round Oregon fir piles. Very unsatisfactory results were obtained by the usual system of treatment, high pressures (200 lbs.) continued for a long time (32 to 38 hours), being necessary to give effective penetration, while the piles were badly checked, split and weakened. The present method, which closely corresponds to that rec-

ommended by Boulton, consists in boiling the timber in the dead oil to extract the sap, and then forcing the oil in by pressure, both operations being performed in the cylinder for convenience, although an open vat would suffice for the boiling. No vacuum is created, but the vapors produced during boiling are passed through the surface condenser, the outlet of which is left open to the air. The condenser is used to measure the sap extracted, as already described, and the boiling is stopped when the gage shows 6 ins. of sap extracted per cu. ft. of timber per hour. The pressure is 120 lbs. per sq. in. and the treatment lasts 12 to 14 hours per charge; the temperature is about 240° F. The timber is less checked than air-seasoned timber, and as all checking takes place during boiling, the resulting cracks are well filled with creosote. With creosoting, as with burnettizing, Mr. Curtis considers that the greener the wood, the more easily it is penetrated with the preservative, which point we have already commented upon. The plant above described has been in service since May, 1894.

AUTOMATIC BLOCK SYSTEM AND ELECTRO-MECHANICAL SLOT; P. & R. R. R.

Where the block system with automatic signals is adopted on lines carrying a very heavy traffic, it is of course desirable to make the block sections very short, and in order to prevent too much interference with through trains, the double-block or overlapping-block method is sometimes adopted. In this case the post at the entrance of each block carries the home signal for that block and the distant signal for the block beyond.

In an article in our issue of Sept. 20, describing the "normal danger" automatic block system recently installed by the Hall Signal Co., of New York, on the Delaware, Lackawanna & Western R. R., reference was made to the use of the same system, but worked with overlapping blocks, on ten miles of the Philadelphia & Reading Railroad, near Philadelphia, and we give herewith a plan of the latter's signal equipment and a view of one of the signals. The plant is in operation between Fairmount Ave., Philadelphia, and Jenkintown, a distance of 9.9 miles. There are 21 blocks, the shortest being about 800 ft. There are 76 signals, protecting three junctions, 97 switches, and one four-track section. At the six junctions interlocking plants, with semaphore signals, have been put in by the Johnson Railroad Signal Co., of Rahway, N. J., and these are worked in connection with the general system by means of the electro-mechanical slot which is a specialty of that company. At junctions, etc., the disk block signals and semaphore switch signals are set on the same post, the latter being the home signal and not merely a route signal, as on the D., L. & W. R. R. The ordinary posts have two disk signals; the upper one is called the "block" signal, having a red disk and light, and governing the track in the block immediately ahead of it; the lower one is called the "caution" signal, having a green disk and light, and indicating the position of the next "block" signal in advance.

Each switch is provided with a switch instrument connected to its points in such a manner that the opening of any switch will hold the block signal of that block, and its corresponding caution signal, at danger until the switch is again closed. The opening of a switch at either end of a main track cross-over will hold the signals on both tracks at danger. Neither switch of a cross-over must be opened until a train movement is to be made, and in all cases the switch nearest the train, in the direction from which the train is approaching, must first be opened. Trainmen are cautioned to be sure to set cars back in sidings beyond the wooden insulating splice plates, as otherwise the signal for that block will remain at danger.

The plant was completed and put in service on Sept. 23. In the construction many special difficulties were met with owing to the fact that the route on which the signals are used is through a thickly-populated portion of the city of Philadelphia, and is crossed by a number of grade crossings upon which the street traffic is very heavy. Between Fairmount Ave. and Huntington St., 1.9 miles, there are 20 grade crossings, seven of which are used by electric cars and two by horse cars. Between Huntington St. and Jenkintown, 8 miles, there are 11 grade crossings, one of which is used by an electric railway, making a total of 31 grade crossings between Fairmount Ave. and Jenkintown, a distance of 9.9 miles.

The official time-table shows that the number of movements of regular trains is 338 per day, except Sunday, on that portion of the track between Fairmount Ave. and 16th St. Junction, but Mr. E. C. Tomlinson, Superintendent of the New York & Philadelphia Division, P. & R. R. R., states that an actual count one day in November showed that with the extra switching necessary to transact this business, in addition to the heavy freight and coal traffic, there was an actual total of 741 movements in 24 hours. Between Tabor Junction and Jenkintown, the average movements are about

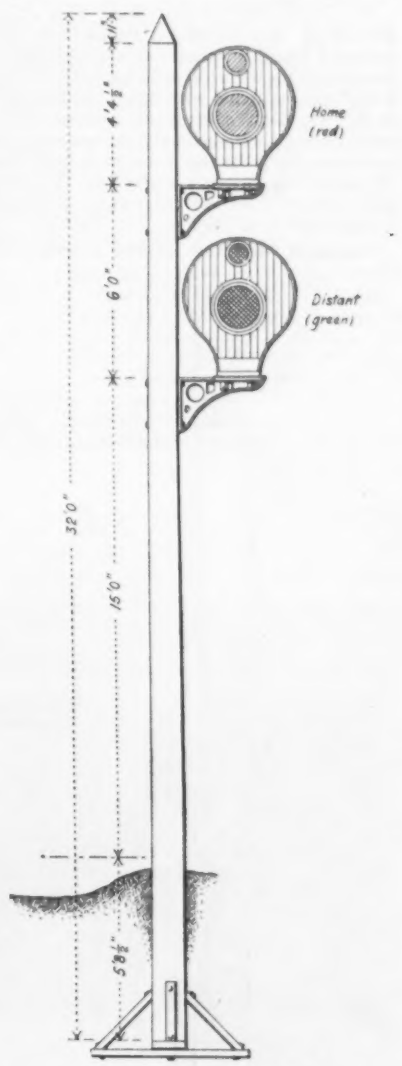


Fig. 2. Signals for the Hall Double Block Automatic Signal System; Philadelphia & Reading R. R.

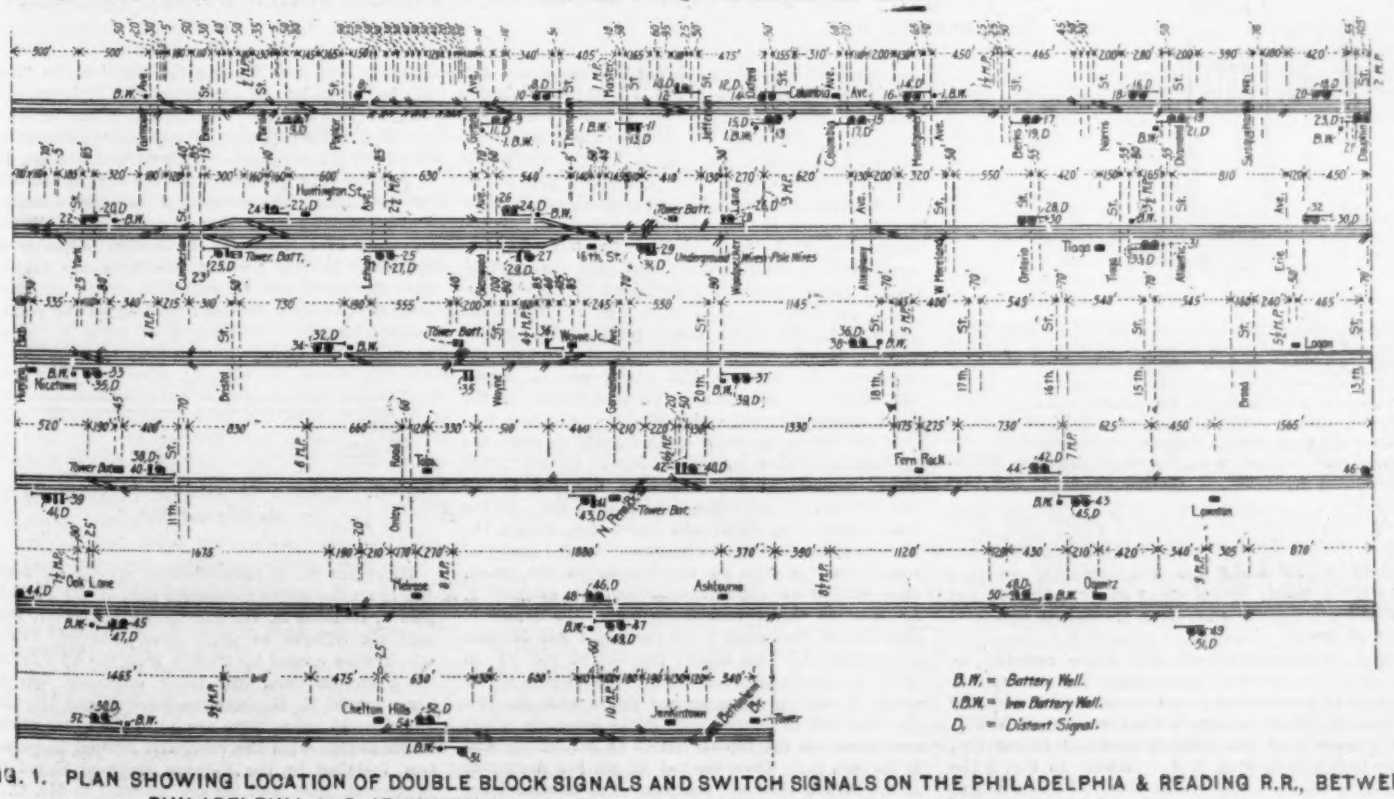


FIG. 1. PLAN SHOWING LOCATION OF DOUBLE BLOCK SIGNALS AND SWITCH SIGNALS ON THE PHILADELPHIA & READING R.R., BETWEEN PHILADELPHIA AND JENKINTOWN, PA. The Hall Signal Co., and the Johnson Railroad Signal Co., Contractors.

200 daily. Mr. Tomlinson states that the traffic has been handled without delay, and that the apparatus meets with all requirements. No inherent fault has been found with the apparatus, and it has been more than efficient in locating two broken rails since in use, in addition to showing several open switches. In the distance covered there are 97 main line switches protected. The following are extracts from the rules governing the traffic on this portion of the line:

Enginemen must, upon passing a distant signal at caution, reduce speed and be prepared to stop before passing the next block signal, if at danger. A white light in either block or caution signals, by night, or the absence of a red disk in the block signals, or the absence of a green disk in the caution signals, by day, indicates safety. The absence of a light at night in either block or caution signals, or an improperly displayed light or disk in any signal, at any time, will be considered a danger or caution signal as the case may be.

A train finding a block signal at danger must come to a full stop before passing it, and wait one minute, when it may proceed cautiously and under full control, expecting to find a train, open switch or broken rail in the block. If the signal clears before the full minute expires, the train may proceed at the usual rate of speed.

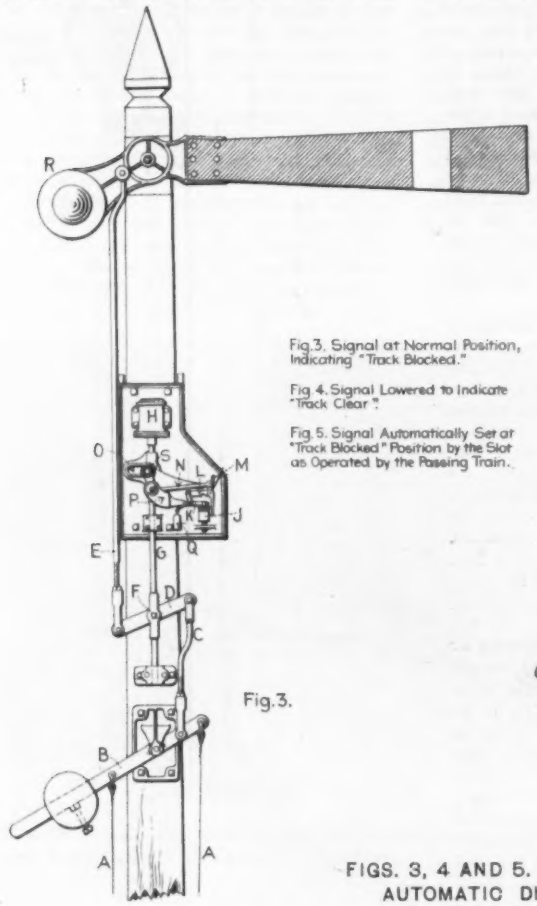


Fig. 3.

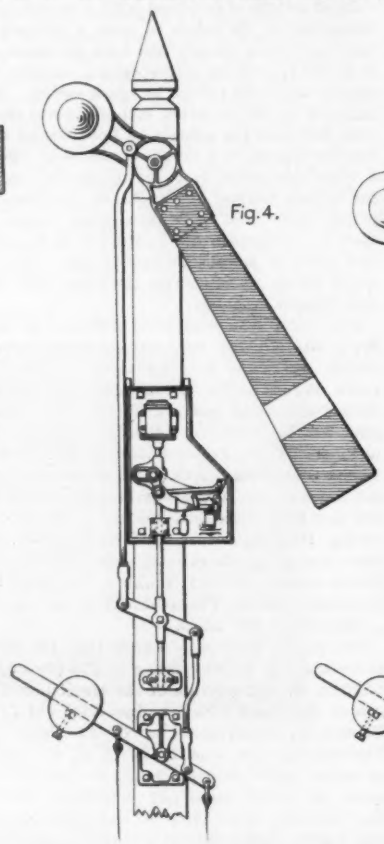


Fig. 4.

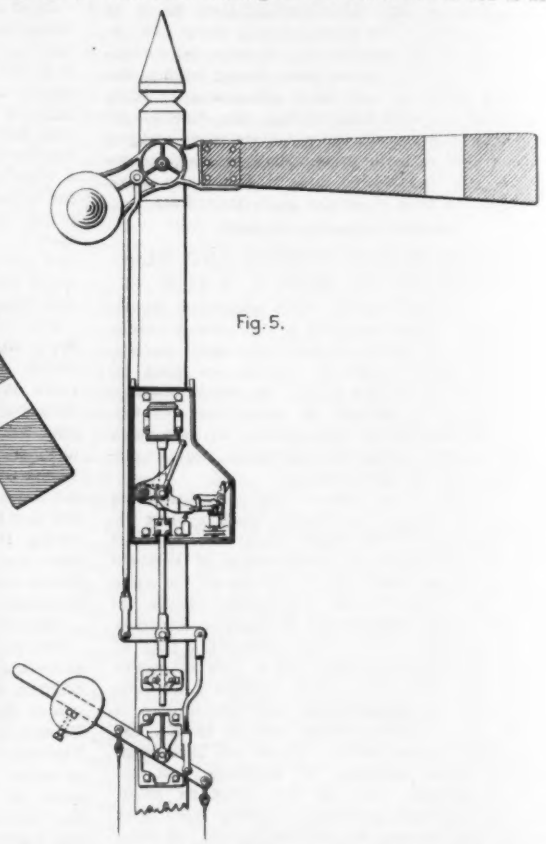


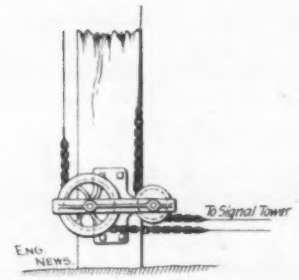
Fig. 5.

Fig. 3. Signal at Normal Position, Indicating "Track Blocked."

Fig. 4. Signal Lowered to Indicate "Track Clear."

Fig. 5. Signal Automatically Set at "Track Blocked" Position by the Slot as Operated by the Passing Train.

FIGS. 3, 4 AND 5. DIFFERENT POSITIONS OF PATENALL ELECTRO-MECHANICAL SLOT INTERLOCKING AUTOMATIC DISK BLOCK SIGNALS AND MANUAL SEMAPHORE SWITCH SIGNALS; PHILADELPHIA & READING R. R.



The electro-mechanical slot, above referred to as being used for controlling the semaphore signals at interlocking points in connection with the automatic block system, is the invention of Mr. T. H. Patenall, of the Johnson Railroad Signal Co., and is shown in Figs. 3, 4, 5 and 6. In Fig. 3 the signal is shown in the "track blocked" position, and in Fig. 4 in the "track clear" position, while Fig. 5 shows the signal as automatically set at the "track blocked" position by the passing of a train into the section which the signal controls. As shown in Fig. 4, the signal has been set by the signalman at the "track clear" position by means of a lever in the interlocking machine and the ordinary wires A A and balance lever B. The connection between this lever B and the semaphore blade is effected through the "slot" by the short connecting rod C and slotted rod G, the upper end of which has a piston working in an air cylinder H, which acts as a cushion and prevents a violent slamming and jarring of the parts. The rod G is held in the position shown in Fig. 4 by the crank N, the end of which is held by the catch M, through the intervention of crank L, lever K and magnet J. The crank N is journaled in the bracket P, which is a part of the box casting. The lever K has a small weight, Q, to counterbalance the parts connected to it, as the magnet is of the ironclad type and has comparatively little pulling capacity, but good holding capacity. This magnet, J, is energized by electric currents, as shown in the sketch, Fig. 6. When the signal is at the "track clear" position the counterweight R of the semaphore arm, through the down rod E, lever D, and slotted rod G, causes the crank N to have an upward thrust at the point engaged by the catch M.

If the section governed by this signal is clear, the signalman is able to pull the signal to the "track clear" position, as shown in Figs. 3 and 4, to permit a train to enter the section. As soon as the train passes the signal and enters the section the circuits shown in Fig. 6 are opened by the electrical connections effected by the wheels on the track, thus cutting out the currents from the magnet J. As soon as this action takes place, the crank N forces back the crank L, at the upper end M, and is disengaged. This allows the slotted rod G to have a downward movement, the point S of crank N moving along in and down with the slot O. The rod G carries with it the lever D, which now turns on the top of rod C as a fulcrum, and in its turn pulls down the rod E, placing the signal at the "track blocked" position. The balance lever B and the different connections are then in the position shown in Fig. 5. The signalman then puts his lever into the "blocked" position, thus returning the lever B, crank N, and other parts to their normal position, as at Fig. 3, the lever D now turning on the bottom of rod E as a fulcrum.

If the section controlled by the signal is occupied, or if one of the circuits controlling the magnet J is open, then should the signalman attempt to pull off the signal to indicate "track clear," he would simply move the balance lever B and its connecting parts, the lever turning on the lower end of rod E as a fulcrum, and thus leaving the signal at its "track blocked" position, as shown in Fig. 5, because the magnet J would not be energized and crank N would thrust over crank L and become disengaged. When all the parts are in their normal position, Fig. 3, and the train passes out of the section controlled by the signal, the magnet J becomes energized, and holds down lever K, preventing crank N from thrusting over the crank L, and so becoming disengaged. In this position the parts are held so that the signal can be pulled to the "track clear" position, the lever D again turning on the point F as its fulcrum.

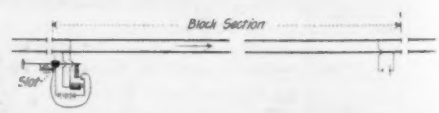


Fig. 6. Electric Cirtuits for Paternall Electro-Mechan cal Slot.

There are 82 of these slots in service, of which 12 are on the above-mentioned part of the Philadelphia & Reading R. R., and during December, 1894, only six failures to work were recorded, five of which were caused by trouble with the battery and track circuits, and one being unknown. On the Long Island R. R., between Long Island City and Jamaica, 10 miles, there are 30 of the slots, worked in connection with the controlled-manual block system installed by the Johnson Railroad Signal Co. in August, 1894, and we are indebted to Mr. C. L. Addison, Signal Engineer of the Long Island Co.,

for the following records of three months' operation and failure:

	Operations.	Failures.
October	48,875	23
November	42,808	15
December	42,786	21
Total	134,469	59

The 59 failures recorded are failures to clear the signal when the lever is pulled, and 12 failures to clear the signals, owing to wires being frozen in street trunks, are not included, having no relation to the efficiency of the slot device. The failures recorded do not include failures to block behind the train, as the road has no way of keeping a record of the latter, since in some cases the operator throws his lever and puts the signal at "track blocked" before the signal has gone automatically to its normal position. It need hardly be added that these "failures" do not place in jeopardy any train, as the entire mechanism is designed in conformity to the well-known law of correct signalling that any failure of the mechanism must cause the danger signal to be displayed.

THE PERKINS SURFACE HEATER FOR REPAIRING ASPHALT PAVEMENTS.

One of the most annoying features connected with the maintenance of asphalt pavements is the difficulty of adding a patch of new material so as to secure a good joint and not leave an elevation or depression in the street surface. The ordinary manner of making such a patch is to cut out a piece of the old pavement and fill in the hole with fresh asphalt, which is then subjected to tamping and rolling in the usual way. Unless great care is taken the contraction of the new asphalt in cooling will leave a depression, and in almost any case the junction of the old and new material will be imperfect and leave a ridge, or more often, a crease of disintegrating material. One of the chief points in making such repairs, therefore, is to secure a perfect weld between the old and the new material, and in the accompanying cut we illustrate a device designed for this purpose, and which is now being used with success in a number of large cities.

The engraving represents the device, which is called the Perkins surface heater, ready for use, and shows one of the older machines. The present heater is somewhat larger and has some improvements in the operation and construction of the burners. As will be seen, it consists of a metal tank mounted on wheels, and to the rear of this a series of burners surrounded by a wire netting packed with asbestos cement. The tank, which has a capacity of about ½ bbl., contains gasoline. The air pump at the head of the tank is used to force the gasoline to the burners, where, coming in contact with the heat, gas is formed. The purpose of the asbestos cement packing is to conserve and diffuse the heat. Each burner can be turned on and off at will, and when all are burning the tank will keep them running for about five hours. The heater complete weighs about 700 lbs.

The method of operation is to place the heater over the space to be repaired and turn on the heat. In a very short time the entire surface of the pavement under the hood is softened by the heat, so that the top can be removed with a hoe. Only sufficient of the old material is taken off to secure a clean fresh surface, when the fresh asphalt is applied and tamped and rolled to the proper surface. The result of using the burner is to leave the old asphalt soft and hot, so that the new material welds perfectly with it. Another advantage is that only the disintegrated portion of the old asphalt is removed, say, from ½ to 1 in., so that not only is less new material used, but the thin coating is more easily rolled and tamped and less likely to contract and leave a depression.

Among the other advantages and economies claimed by the manufacturers are the following:

(1) In making repairs by this process, no joint has to be cut; in fact, the cutter by this process is almost entirely dispensed with, being used only when it is inconvenient to use the heater.

(2) It is not necessary to remove all of the old asphalt to the concrete, binder or cushion, as the case may be, to get a joint for the new material.

(3) A patch ½ in. thick, or even less, can be put on, making a perfect weld without any danger of scaling.

(4) A high place, or wave, in the pavement may be heated and scraped off to the level of the pavement without burning or injuring the cement.

(5) The repairs made with this heater are always more perfect than the best repairs by the old method. The patches being thinner, the compression is perfect and the patch is left not higher nor lower than the surrounding work.

(6) Under the existing method of making repairs, especially if the day is cold when they are made, the old surface is in a contracted condition, while the new material put in, being in a heated condition, is considerably expanded. If the patch is left perfectly level with the surrounding pavement when finished, in a few days, and especially in cold weather, by contraction and vehicle compression, the patch is lower than the adjacent surface. In hot summer weather the expansion of the surrounding pavement has a tendency to push this patch on every side and make it rise above the surface surrounding it, causing a slight ridge along the line of the joint or weld and a rough place in the pavement. By the use of the heater the old and new are welded at practically the same temperature, and they become homogeneous at once; the joints do not pull apart in winter, nor raise above the adjacent surface in summer.

(7) This process is applicable alike to the repair of openings, cracks, depressions, and the resurfacing of an entire street. In fact, the principle involved in the above device solves the question as to how long an asphalt top will last; the answer being that it will last for all time, with a comparatively small outlay for annual repairs, and occasional resurfacing at long periods.

The heater is now being used in New Orleans, La.; Chicago, Ill.; Indianapolis, Ind.; Buffalo, N. Y., and several other large cities. In response to an inquiry respecting the value of the device for repairing asphalt pavements, we have received the following letters:

Sir: I consider this one of the most important inventions ever made so far as the maintenance of asphalt pavements is concerned. It has reduced the cost of such repairs to a fraction of what they were under the methods pursued universally in this country prior to its introduction. The effect is, that without burning the material, it reduces that portion of the old pavement to be repaired to substantially its original condition of softness and pliability. To the old pavement thus heated there is added whatever may be required, and the union of the old and new material we find by experience is perfect. By this method there is no waste of the old material as was made under the old method.

The repair is so perfect that after a few hours of traffic the lines of the joints cannot be found. We have had notable instances in this city of pavements showing such defects as caused great anxiety to this department, and serious consideration as to whether the pavement should not be relaid. The expenditure of a few hundred dollars in such a case put the street in first-class condition, and it appeared substantially as good as when it was first laid. I have particularly noticed the contractors using this machine in the laying of new pavements where it becomes necessary to make a joint. This work is done perfectly, and the lines of the joints cannot be seen.

The owners of this machine inform me that the saving in its use in making the average kind of repairs will amount to $100 per day for each machine; and from my observation I do not doubt the truth of their statement. I consider this machine of the greatest value to cities having large areas of asphalt pavements to keep in repair. It certainly minimizes the cost of such work, and in its use traffic is not interrupted, as the work is done so quickly and thoroughly. It is my conclusion that, with the use of this machine making repairs from time to time as small defects appear in a pavement, a well constructed asphalt pavement will last indefinitely and would not be relaid wholly in 30 or 40 years. Very truly yours,

J. H. Flagg.
Chief Engineer, Bureau of Street Engineering.

Chicago, Ill., Jan. 21, 1895.

Sir: Replying to a letter referred to this bureau by the Superintendent of Streets about the Perkins Surface Heater for the repair of asphalt pavements, will say: We have not had very much experience with it, as it and another heater were used in an experimental way more than any other during a few months of last year. I saw enough of the workings of this machine to satisfy me that for most of the repairs necessary to make on an asphalt pavement they are useful and economical tools. Yours truly,

S. J. Fields,
Chief Engineer, Bureau of Engineering.

Buffalo, N. Y., Jan. 26, 1895.

Sir: I have seen the heaters in operation on St. Charles Ave., and from the best of my opinion they appear to be satisfactory and to give good results.

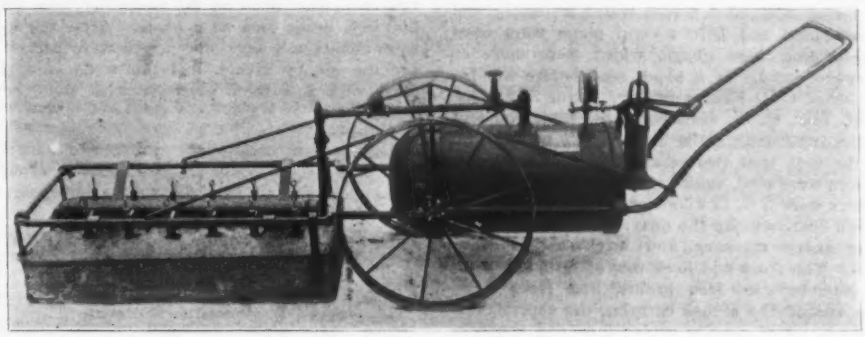
Respectfully, Peter Farrel,
Commissioner of Public Works.

New Orleans, La., Feb. 2, 1895.

In a letter to the Barber Asphalt Co., written after the machine had been used a longer time, Mr. Farrel says:

I find that the new coating of asphalt laid on top of the old pavement after it had been heated up forms a perfect bond, and after cutting through the pavement I find that it is difficult to discern where the bond is made. In addition to this, your new system has the advantage of going over the streets quickly, and does not necessitate the tearing up of the old pavement.

The inventor of the heater is Mr. A. H. Perkins, of Chicago, and the patents are owned and controlled by the United States Repair & Guarantee Co., 36 La Salle St., Chicago, Ill. The company does not manufacture the heaters for sale, but sells the right to use them in different territories, and supplies the heaters to the purchasers of these rights according to special agreements. We are indebted to the above company for the matter from which our illustration and this description have been prepared.



THE PERKINS SURFACE HEATER FOR REPAIRING ASPHALT PAVEMENTS.

ENGINEERING SCHOOLS IN GERMANY.

Prof. W. S. Chaplin, Chancellor of Washington University, at St. Louis, Mo., addressed the St. Louis Engineers' Club on March 20 on the subject of engineering schools in Germany. The following is an abstract of the address:

He visited Germany in the summer of 1894 and took occasion to make a special study of the technical high schools in Berlin and Hanover. He was first struck with the size and magnificence of the buildings, the idea being that expenditures of this character would impress the people favorably, and tend to make the schools rank favorably in comparison with the older universities. The schools were provided with elaborate collections of models, representing all sorts of machinery. These models, however, were not used by the students, but by the professors only. Chemistry was taught to engineering students by lectures only. No students, except those intending to be chemists, were allowed to handle chemicals. The theses were accompanied by very fine drawings, but it seemed that all the designs and computations were made by the professors, the student simply executing the drawings under the immediate direction of the professors. It was necessary to pass two important examinations, one at the end of two years and the other at the end of four years, at which time the student graduated, and took the state examination. It was necessary to pass

the latter if the student expected to follow the profession and find employment.

The professors in the technical high schools were looked down upon by those in the universities. Engineers were considered technical and not scientific men. In a recent discussion among German engineers regarding engineering education, it was considered that a ground-work in theory was absolutely essential, but it was necessary also that the student be taught the application of the theories to every-day problems.

German engineering students put in from 41 to 44 hours per week at school, while 35 hours is considered a high number in this country. Besides this, it is necessary to do a considerable amount of home work at night.

He had expected to learn many things of value, but was disappointed. He thought that, on the whole, the training given by American engineering schools was much better suited to American conditions. The technical high schools are entirely distinct from the universities. There are no graduate students. Instruction is simply by lectures, text-books being used only in mathematics. The standard of entrance is higher than in our schools, and the course of study more thorough, but the field covered is not as wide or as general. The schools are supported almost wholly by government grants, the fees paid forming probably not to exceed 10% of the income.

CONCRETE WELL MONOLITHIC DOCK FOUNDATIONS AT NEWCASTLE, ENG.

The old Newcastle quays, extending about 4,620 ft. along the north bank of the River Tyne, were commenced in 1840, the depth of water outside varying from 2 to 6 ft. The requirements of commerce soon demanded deeper water alongside, and between 1866 and 1870 several plans were tried for rebuilding these quays, which were more or less unsuccessful. In a paper read before the Institution of Civil Engineers, Mr. Adam Scott, Assoc. M. Inst. C. E., describes these attempts, and also the later quay walls built at this point.

In the first trial two parallel rows of cast iron cylinders were used, sunk by compressed air. These cylinders were 5 ft. in diameter, placed 25 ft. apart between centers along the quay, and over the intervening space masonry and brick arches were turned. The front and back row of cylinders were connected by cast iron beams, and from these beams sprang the arches carrying the superstructure, made up of granite ashlar face and concrete backing. Between the front cylinders metal sheet-piling was driven in the form of a segment, curving inward and terminating at low water. Before the dredging in front of this wall had reached the 22-ft. depth intended at low water, the wall began to shows signs of weakness, and, in 1876, a large part of it was strengthened by sinking at the back a trench filled with concrete, 11½ ft. wide and carried 8 ft. below low water.

The next wall was built with a continuous row of 6-ft. cylinders placed 13 ft. 9 ins. apart from center to center, and back of these cylinders were others 5 ft. in diameter. Between the front row elliptical cylinders were sunk in the place of the sheet-piling. The latter were found to be too weak to stand the pressure, and were unsafe for the workmen; and finally a close row of 6-ft. cylinders was used, with 5-ft. cylinders behind them, and the alternate front and back cylinder were tied together by wrought iron bands.

In 1886 part of the old quay of 1840 failed, and Mr. P. G. Messent and Mr. W. G. Laws, the City Engineer, recommended the construction of a deep water quay, with 20 ft. of water at low tide, founded upon well-monoliths of concrete. This plan was carried out by the city on the day's-work system.

The substructure of this wall was a concrete monolithic block, 30 ft. long, 20 ft. wide and 37 ft. deep, with a well inside 20 × 10 ft., leaving walls 5 ft. thick; the estimated weight of one of these blocks was 1,360 tons. They were sunk 2 ft. apart to a depth of 32½ below low water, and the intervening space and the interior were finally filled with concrete, and a masonry wall built upon them. Nine of these blocks were sunk in 1890-'93.

The operation of sinking is described as follows: A temporary line of sheet-piles was driven back of the line of the new wall, and the site cleared as well as could be done without diving or dredging. A wooden V-shaped curb was built, 6 ft. high by 5 ft. wide at top, armed with a cast iron cutting edge 2 ft. deep, with vertical wrought iron straps passing up the sides of the curb. The finished curb was let down in four parts and bolted together at the corners after the bottom had been leveled off. As the water at low tide was only about 2½ ft. deep, the curb was so set as to leave between 3 and 4 ft. of the curb above that level. Straps were put across the corners to keep the sides from bulging out, and the curbs were then filled with concrete, and the building of the 5-ft. walls commenced. The molds used were 3 ft. deep, and were carried on 9 × 3-in. standards.

After each 3-ft. course was built up, time was allowed for the concrete to set; and, when four courses, or 12 ft. of wall, had been constructed the molds were stripped off and the monolith was sunk by dredging inside until only 4 ft. again stood above low water mark. This process was continued until the toe of the curb was in the hard ballast, 32 to 33 ft. below low-water level. The sinking blocks were not guided in any way, and though they worked slightly out of place and canted somewhat in sinking, the excavation generally righted them again. The blocks had a tendency to move forward from 1½ to 6 ins., and to prevent this movement as far as possible the ground in front of the blocks was weighted with copper slag and old ashlar, which was afterwards dredged out of the river.

These monoliths passed through a stratum of quicksand and mud about 20 ft. thick, and this material sometimes rushed in and filled the well to a depth of several feet. To aid in the sinking, old rails, etc., were piled on the monoliths, from 220 to 350 tons being used on a block. After the blocks were sunk small bags of concrete were packed under the toe by divers, and the wells were then filled with a 1 to 7 concrete, with some rubble thrown in. The concrete was lowered through the water by skips, which were allowed to touch the bottom before opening. The wells were thus filled to within 2 or 3 ft. of the top before the water was pumped out.

The space between the blocks was piled back and front, and the material in this space was then dredged out by special apparatus, though this work was tedious and troublesome, owing to sand, etc., running in from behind. The superstructure consisted of sandstone ashlar, packed with 1 to 5 concrete, and finished with an Aberdeen granite coping 4 ft. wide by 1 ft. 9 ins. thick. Owing to limited space available,much of the material had to be handled twice or oftener; but few men could be employed, and a considerable part of the work was tidal and carried on at night. Under these circumstances the quay cost about $326 per lineal foot, including filling behind wall, but exclusive of plant, paving and dredging.

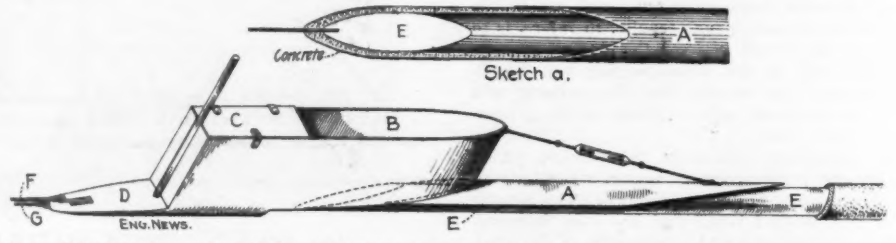
A somewhat similar plan was adopted for the Cessnock Dock,Glasgow (Eng. News,June 2, 1892).

THE RANSOME SYSTEM OF MONOLITHIC CONCRETE CONDUIT CONSTRUCTION.

We illustrate herewith a device for constructing monolithic concrete conduits, which has been used with very good success in recent water-works and cable railway work in Denver, Colo., and Oakland, Cal. This apparatus is designed for making all sizes of conduits, from a few inches to several feet in diameter. As is well known, the construction of monolithic concrete conduits by machinery is comparatively a recent thing, and has for the most part been limited to conduits of quite small diameter, generally less than 1 ft. In our issue of Oct. 17, 1891, we described a machine for constructing monolithic conduits, invented by Mr. A. C. Chenoweth, and used in laying a small telephone conduit in connection with the Croton Aqueduct, and also in an experimental way in constructing a 12-in. sewer at High Bridge, N. Y. In our issue of Feb. 1, 1894, a note appeared in relation to the construction of about 900 ft. of 24-in. and a mile of 10-in. Chenoweth sewer pipe at Scarborough-on-Hudson.

The device illustrated herewith was invented by Mr. Ernest L. Ransome, of Chicago, and is simply a portable mold, so devised that the workmen can reach all parts of the conduit with their tamping bars, and also carry on the construction continuously. Fig. 1 gives a view of the mold for making pipes up to 24 ins. in diameter. Fig. 2 shows the mold for large diameters, and Fig. 3 is a modification of the large mold, to be used for especially large conduits.

In their general principle all the molds are alike, and a description of the small mold (Fig. 1) will apply, with some modifications, to all. There are two parts to this small mold, the structure, ABCD, being one part, and the core mold, or mandril, E, being the other part. When the apparatus lies at the bottom of the trench the prow, or shaper, D, which is loaded by the weight in the box, C, serves to shape and compress the earth ahead of the work. Following the shaper, D, in the track made by it comes the core mold, E. This core mold has a sloping front, as shown by Sketch a, Fig. 1, which enables the concrete to be tamped at every point of the cylinder, as clearly shown. If the core mold was cut square off in front, the convexity of the cylinder would prevent access to the concrete under the mold and below the middle line of the sides. The core mold, as already stated, is separate from the other part of the apparatus,



FIG, 1. RANSOME'S MOLD FOR MAKING MONOLITHIC CONCRETE CONDUITS UP TO 2 FT. IN DIAMETER.

and is pulled along by the cord, F. As will be seen, the core mold enables the bottom and the sides of the conduit as high as the middle line to be constructed. To construct the upper half of the conduit, the cap mold, A, is used. This cap mold is a segment of a hollow metal cylinder, which sets down over the core mold, i. e., the outside of the core mold and the inside of the cap mold are concentric, with a distance between them equal to the thickness of the concrete walls of the pipe. The front of this cap mold is sloping, as shown by Sketch a, Fig. 1, for the same purpose that the front of the core mold is sloping.

The construction is carried on by placing concrete in the hopper, B, and packing it under and at the sides of the core mold, after which the core mold is pulled ahead by means of the rope, F, and the top part of the conduit formed. The cap mold is then pulled ahead by means of the rope, G, and the operation just described repeated. In this way the conduit construction is carried on continuously.

It will be seen that the core mold projects back into the completed pipe some distance. The object of this is to secure a support for the green concrete while the earth is filled in and tamped around it. It has been found that if this filling is packed firmly at the sides and top of the conduit it serves to hold the green concrete in position without any further support. For large conduits, however, a special support or centering is required to keep the top part of the conduit from falling in or becoming distorted, and the insertion of this support necessitates some modifications of the small conduit molds to adapt them for large conduit construction. Fig. 2 shows the mold for large diameter pipes.

In this illustration D represents the shaper, A the cap mold and E the core mold as before. The

top part of the core mold is made with a projecting horn, K, on which are strung the half rings, R R, which serve as the top of the core mold, and, since they are left behind as the mold moves forward, also as centers to support the concrete. Sketch a, Fig. 2, shows the construction of the core mold. As each ring moves off the rear of the horn, K, small iron struts are placed vertically and horizontally inside them, as shown by Sketch b, Fig. 2. This work is generally done by a small boy, who sits inside the sewer.

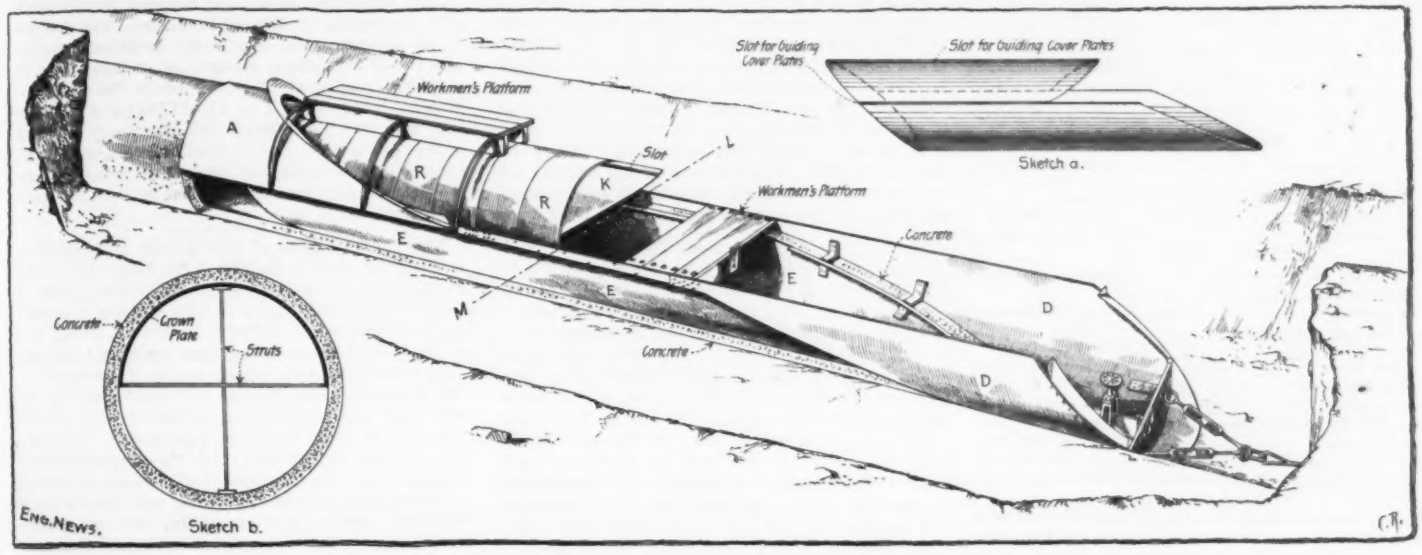


FIG. 2. MOLD FOR MAKING MONOLITHIC CONCRETE CONDUITS OVER 2 FT. IN DIAMETER.

In the small mold the core mold and cap mold had a reciprocating motion, but since the crown plates, R R, intervene between the core mold and the soft concrete, and prevent the drag of the mold on the upper half of the pipe, it is not necessary to move the two molds reciprocally here, and they are coupled together and moved at the same time.

When the conduit is so large that the crown plates become unwieldy, another modification of the core mold is made. This mold is now separated from the cap mold and shaper, and divided into rings set up side by side, as shown in Fig. 3. In this case the method of operation is as follows:

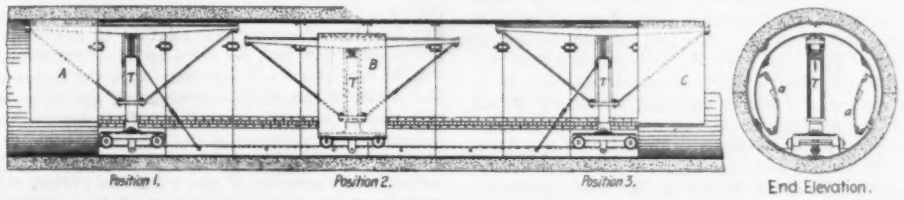


FIG. 3. DETAIL OF CORE MOLD WITH LARGE CONDUIT MOLD IN SPECIALLY HEAVY WORK.

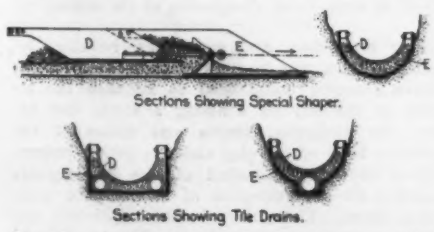


Fig. 4. Modifications of Ransome's Sewer Mold for Work in Wet Ground.

The traveller, T, is moved back into the sewer to the point designated as position 1, where the concrete has become hard enough to permit of the rings being removed. The bottom sections of the ring, A, are folded back, as shown at aa in the end elevation, and the screw jack lowered. This leaves the traveller carrying the ring, as shown at Position 2, and in the end elevation, in which position it is run forward to Position 3, where the ring is slipped forward to C, the jack raised, and the flaps, aa, let down and fastened. One ring after another is thus brought forward as fast as needed. The sloping prow of the core mold, of which the rings form the barrel, is in this case attached to a cap mold and shaper, and moves independently of the rings. This construction will be easily understood by conceiving the core mold, E, Fig. 2, cut vertically on the plane, M L, and the entire rear part removed. If the crown plates R R, are then made complete rings, instead of segments of rings, they will replace the rear part or barrel, which has been cut off.

When constructing conduits in wet ground the ordinary forms of molds described above have to be somewhat modified to provide for drainage and prevent the seepage water from coming into contact with the green concrete. This modification consists simply in attaching an extra shaper to the front of the ordinary mold. In Fig. 4, D is the regular shaper attached to all molds and E is the extra shaper for wet ground work. As will be seen, the purpose of this extra shaper is to allow the bottom of the trench to be filled with broken stones, or if the seepage is very great, to permit of the laying of tile drains, as shown in the different sections. When working in wet ground the mold is drawn up grade, so that the water will flow back, underneath the conduit, away from the work. To permit of free flow of the water, holes are cut in the bottom of the conduit at some distance back, where the concrete is firmly set, which allows the seepage water to enter the conduit from the broken stone below.

As stated above, the mold has been used at Denver, Colo., and Oakland, Cal. At Denver it was employed in making about 7,000 ft. of 38-in. pipe, including the lining of a 900-ft. tunnel, for the Citizens' Water Co. In a letter to Mr. Ransome, Mr. J. D. Schuyler, M. Am. Soc. C. E., Consulting Engr., Citizens' Water Co., Denver, says:

> We used to average about 300 ft. of pipe daily, and could have made double that quantity if we had had more supporting plates and greater capacity in our concrete mixer. I am satisfied that on straight work, with ditch of proper size, and with abundance of concrete, the machine will make from 600 to 800 ft. daily, of pipe of good quality. When everything worked well, the 38-in. pipe, 2½ to 3 ins. thick, cost $1.30 per ft., with a mixture of 1 part of Portland cement to 3½ parts of sand and gravel. This was with cement at $3.75 per bbl., gravel at $1.25 per cu. yd., and labor at $1.75 per day.

At Oakland, Cal., the mold was used in building the cable conduits of the Oakland & Piedmont Cable Ry. Two molds were used, one for each track, and about 400 ft. of conduit was laid with each mold daily.

A company is now being organized to place this mold on the market. At present all business is carried on by Ransome & Smith, Boylston Building, Chicago, Ill., of which firm Mr. Ernest L. Ransome is President. We are indebted to Mr. Ransome for the matter from which these illustrations and the description have been prepared.

AN EXPERIMENT ON THE FRICTION IN A 21-IN. WATER-MAIN.*

By Charles Arthur Friend, M. Inst. C. E.

The observations described in this paper were recently made to determine the loss of head in the cast iron water-main supplying the city of Seville from a reservoir 7½ miles distant, when discharging at its maximum daily rate. This main was laid in 1884, and, so far as can be ascertained, is free from corrosion or deposit.

The pressure was observed by a gage in the sluice-house in Seville, and the loss of head deduced in each case is the difference between this pressure or head and the static-head, or difference of levels between the pipe at the sluice-house and the level of the water in the distant reservoir. The instrument used to measure the pressure in the sluice-house was a Bourdon gage, which had been tested for the purpose of the experiment and found to be indicating correctly. The length of the main between the reservoir and the sluice-house was 42,050 ft., and its diameter was 21 ins. The quantity of water flowing in the main was calculated from hourly readings of the level of the water in the reservoir in conjunction with those of the revolutions of the pumping engine, the amount of water pumped, per stroke of the pump being known.

In all, twelve results are given in the paper, calculated from the average rate of flow, and the average pressure observed during each one of twelve hours. It was found that the actual rate of delivery of the main more nearly coincided with the value indicated by accepted formulas as the period of maximum flow was approached, at which time the variation of pressure indicated by the gage was a minimum. Of these results, however, one only, that for the hour 10-11 a. m., during which the pressure was steady, is regarded as reliable. The following statement of this result shows, in addition to the observed loss of head, that deduced from Darcy's formula for clean pipes, which, transposed, gives

$$h = \frac{1\ Q^2}{1850\ d^5},$$

and from Unwin's formula for new pipes, which gives

$$h = \frac{1\ Q^2}{1887\ d^5},$$

where h, l and d are the loss of head, length of the pipe, and diameter of the pipe, respectively, in feet, and Q is the rate of flow in cubic feet per second.

		Loss of Head, ft.,		
Hour.	Rate of Flow. Cu. ft. per second.	Observed.	Cal'lated from Darcy's formula.	Cal'lated from Unwin's formula.
10-11 a. m.	7.098	63.57	69.06	68.29

* From Selected Papers of the Institution of Civil Engineers.

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In speaking of the consolidation of the Astor, Lenox and Tilden libraries in New York city, we called attention, in our issue of March 21, to the great need of a good engineering reference library in New York city and the desirability of making a strenuous effort to see that this important department of knowledge received proper recognition in the plans of the trustees of the consolidated fund. It is worthy of note, in the same connection, that the new John Crerar Library, in Chicago, is to be devoted entirely to science, with especial attention to its application to practical work in engineering and the allied professions. The total sum left by Mr. Crerar for library purposes was $2,500,000, and the trustees have decided to expend only the income of this fund each year. It is understood that for the present the money will be devoted to the purchase of books, leaving the question of a library building to be determined in the future, and that the library will be thrown open to the public just as soon as practicable. Mr. Clement W. Andrews, at present librarian of the Massachusetts Institute of Technology, has been appointed librarian of the new Crerar Library, which is in itself a happy promise for the development of the engineering side of the library work; but aside from this fact, we are assured that the trustees are agreed that particular attention should be paid to engineering literature and especially to the supply of periodical literature in all branches of science. It is too early yet to comment on the plan and scope of this library, but the mere fact that it is to be a library devoted to practical science is a matter of sincere congratulation to engineers and men of science throughout the country; and especially in this case since the decision of the trustees to devote the library to science was entirely voluntary.

A feature which we seldom see mentioned in the discussion of the equipment and organization of the City Engineer's office is the provision of a testing laboratory equipped with the necessary appliances for conducting at least the more simple tests of cements, paving brick and similar materials used in city work. The reason for this is not far to seek. Few city engineers, probably, will dispute the benefits to be derived from such a testing laboratory, but it is a much more difficult matter to get a City Council to appreciate them. The ordinary councilman can understand that testing machines and appliances will cost so many dollars, but he has only a dim appreciation of the saving that may result from their use, through the securing of better and more durable materials. The result of this is that in the majority of American cities there is nothing approaching a fairly thorough test of the material used in city work, except in the case of very important individual structures, where, perhaps, the services of one of the various testing laboratories are temporarily secured. The blame for this cannot in all respects be attributed to the City Council alone, however. Too often the City Engineer himself is apathetic in urging such innovations, either from mistaken ideas of economy or from the belief that it will be labor wasted. In the majority of cities it is probable indeed that the engineer would receive very little encouragement in his efforts, but it may be questioned whether this is not in many cases due largely to improperly directed efforts.

In this connection the work of securing a well-equipped testing laboratory by the city of Peoria, Ill., is of interest. At the outset the council of that city was no exception to the general run of municipal bodies in its opinion of the uselessness of a thorough system of tests for materials used in the public works of the city, but fortunately, the City Engineer at that time, Mr. Jacob A. Harman, thought differently; and not only that, but he set energetically at work to make his superior officers think differently. In this work he first drew up a definite plan of such a laboratory as he conceived to be essential, stating definitely the style, character and purposes of the various machines and appliances needed. This being done, he obtained a proposition from one of the exhibitors of such apparatus at the Columbian Exposition, by which that company agreed to furnish certain machines which had formed a part of its exhibit on very reasonable terms. This was all laid before the city officials with such arguments, figures and explanations as he considered most convincing. The result was that the city finally purchased and established in appropriate quarters a 100,000-lb. Riehle screw power testing machine, a Riehle 2,000-lb. cement testing machine, a full complement of sieves and wires for cement testing, and a foundry rattler, scales, vats, etc., for brick tests, together with a 12-in. Pelton motor for supplying the necessary power. The total cost of the laboratory was approximately $1,500, which is considerably less than the cost of a similarly equipped laboratory would be under ordinary conditions, owing to the reduced prices at which machines exhibited at the Columbian Exposition had been secured. Under ordinary conditions, however, $2,500 at the most would secure the same equipment. This laboratory was completed in working order in the fall of 1893. During the year 1894, all the material for 52,000 sq. yds. of brick paving, costing $150,258, was tested in the laboratory, besides numerous other tests being made. Assuming the cost of the laboratory to have been $2,500, its first cost to the city was 1.6 per cent. of the cost of this one job of paving only, and its appliances are good with a few inexpensive repairs for many years. The total cost of making all tests in 1894, including other work as well as paving, was 0.17 per cent. of the cost of improvements for which materials were tested. It is not necessary to say that this expense is the merest bagatelle compared with the benefit of insuring good, durable material in all public works, nor is it surprising to find the Commissioner of Public Works, in his report for 1894, saying, "The testing laboratory provided by your honorable body has proved of inestimable value." What has been done in the city of Peoria can be done in many other cities by similar energetic efforts of the City Engineer.

In May next Gen. Thomas Lincoln Casey, who has so long and so ably filled the office of Chief of Engineers, U. S. Army, will be retired on account of age. His natural successor, as next in rank, would be Col. Geo. H. Mendell; but Col. Mendell has been stationed in San Francisco ever since the end of the Civil War, has large private interests there, and, we understand, does not care to come East for a short term of service as Chief of Engineers, as he also would reach the age limit on Oct. 12, 1895. The next in order of rank is Brevet Brig.-Gen. Henry L. Abbot, who is to retire on Aug. 13, 1895. In view of the long experience and well-earned engineering reputation of General Abbot, it would seem well were the President to express his approval of his scientific and military services by appointing him Chief of Engineers even for this short period, should he be willing to accept. The work of Gen. Abbot in connection with the study of hydraulics on the Mississippi River, and his experiments with high explosives at Willets Point, are well known to all engineers, and they would doubtless heartily approve of this official recognition of high merit in a brother engineer. The real future Chief of Engineers, however, will be Col. William P. Craighill, who, we understand, does not reach the age of retirement until July 1, 1897. In his hands the control of this important corps can be safely entrusted, the only regret being that he will not have a longer term to serve.

The brief synopsis of the method of controlling engineering work in the city of St. Louis, contained in this issue, is such as could be gleaned from a copy of the City Charter. This charter nowhere mentions the word engineer, as far as noted, but as interpreted by an honest and intelligent Mayor, fully appreciating the requirements of the charter, the design and execution of the public work of the city could only be intrusted to capable and proper officials; in other words, to experienced engineers. The duties, as outlined, and the responsibilities imposed upon the members of the Board of Public Improvements require that these men should have technical training and experience, and, we understand, engineers have so far filled these offices under the new charter. The responsibility for initiating new work or repairing old work on streets, etc., and of dictating how such work should be done rests with this technical bureau, and the City Councils, or the Municipal Assembly, as it is there called, has only the power to approve or to disapprove plans and estimates submitted to them by the Board. But, on the other hand, the Board is required to promptly give all information required to the Assembly concerning any proposed work, and to at all times keep that body intelligently informed as to the condition of the public works of the city. The charter very properly assumes that the framing of ordinances relating to public improvements can best be done by men technically trained and practically familiar with the methods and detail of the work contemplated, and it takes this power from the Assembly. But, for the information and guidance of the legislative body, the charter also demands that these ordinances shall specify the character of the work, its extent, the material to be used, an estimate of the total cost of the work if only a part is to be done at once, and, finally, the fund out of which it is to be paid. This section throws the responsibility for the design and execution of the work where it belongs—upon the technical and administrative department—and leaves the legislative body to act with a full knowledge of the business placed before it. The same ruling places the responsible duty of letting contracts into the hands of the Board of Public Improvements, only permitting the Assembly, as before, to approve or disapprove of its action.

Taken altogether, and sometimes reading between the lines, the framers of this charter seem to have honestly endeavored to advance the interests of the city by drawing a sharp line between the authority, fitness and duties of the legislative body of the city and the duties, responsibilities and proper control of the departments charged with the execution of technical or engineering work. Though, as before mentioned, the word engineer is prominent by its absence throughout the charter, it would be difficult, under the wording of this document, to place work of an engineering character anywhere except in proper hands, except by a flagrant abuse of power and an utter disregard for the character and cost of the public improvements of the city. Without absolutely prescribing the qualifications required of the men appointed as members of the Board of Public Improvements, the charter demands that they must state under oath that they believe themselves to possess all the qualifications necessary, under the provisions of this charter, to intelligently and faithfully perform the duties imposed upon

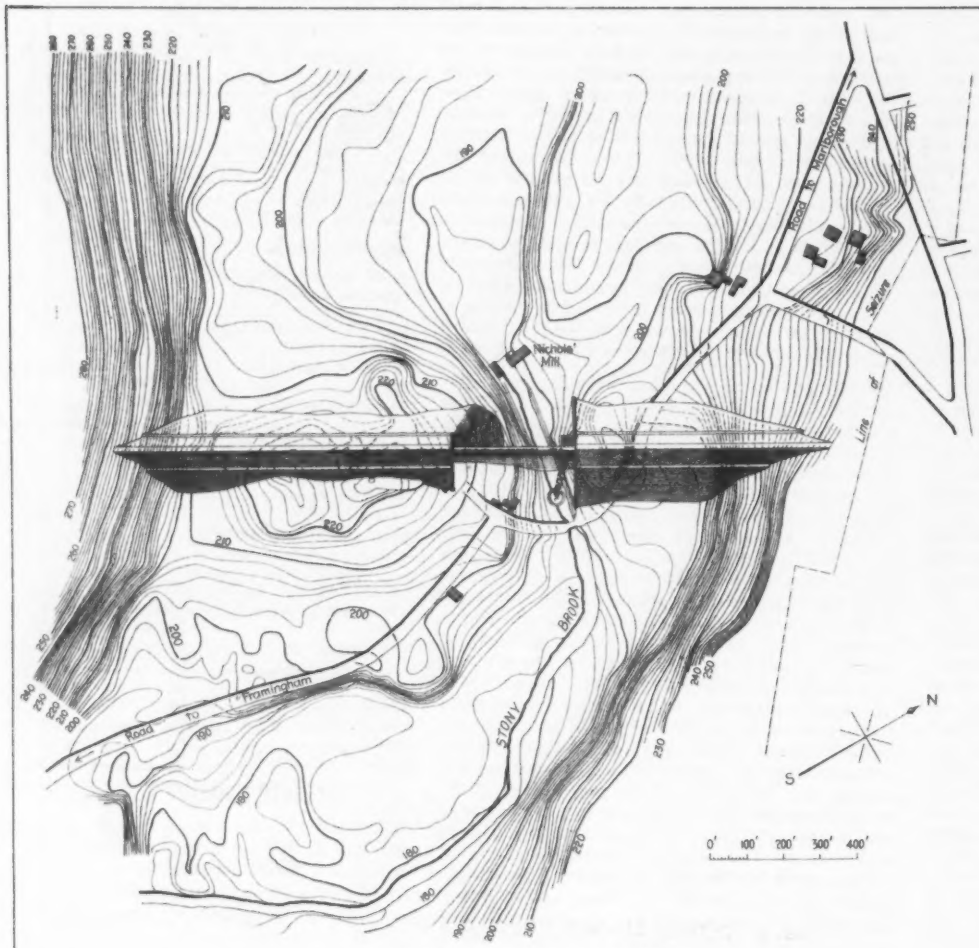


FIG. 1. MAP SHOWING LOCATION OF DAM.

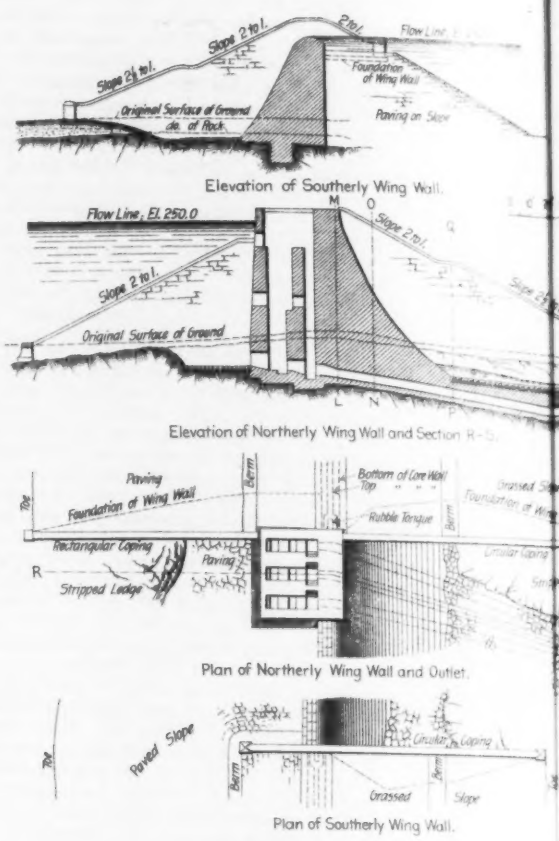


FIG. 6. DETAILS OF OUTLET AND WING WAL

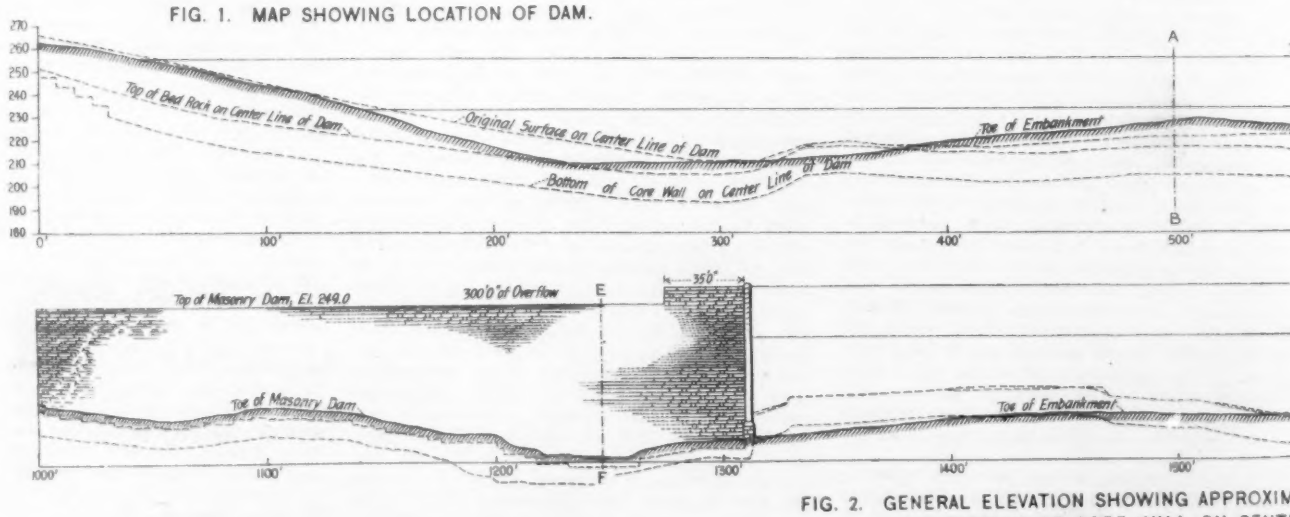

Top of Bed Rock on Center Line of Dam
Original Surface on Center Line of Dam
Bottom of Core Wall on Center Line of Dam
Toe of Embankment
Berm, El. 234.0
Top of Earth Embankment, El. 25
Top of Masonry Dam, El. 249.0
300'0" of Overflow
Toe of Masonry Dam
Toe of Embankment
0' 100' 200' 300' 400' 500' 600'
1000' 1100' 1200' 1300' 1400' 1500'

FIG. 2. GENERAL ELEVATION SHOWING APPROXIMATELY TOPS OF BED AND BOTTOM OF CORE WALL ON CENTER LINE OF DAM.

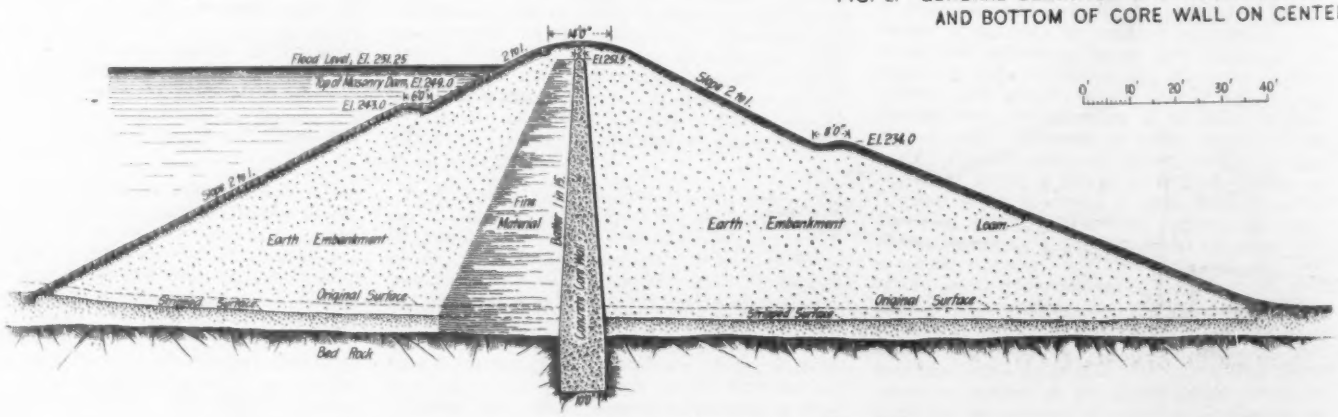
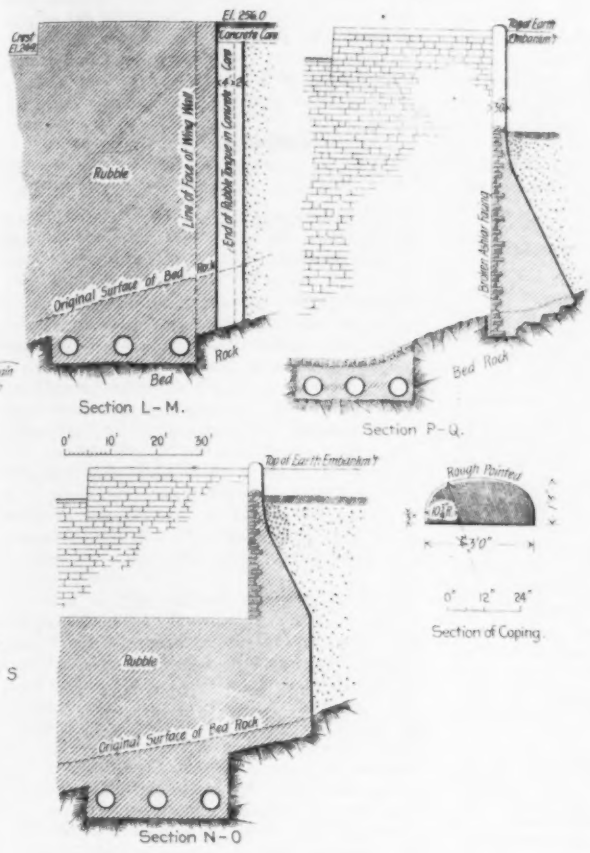


FIG. 4. SECTION C-D ON GENERAL ELEVATION.

D WING WALLS.



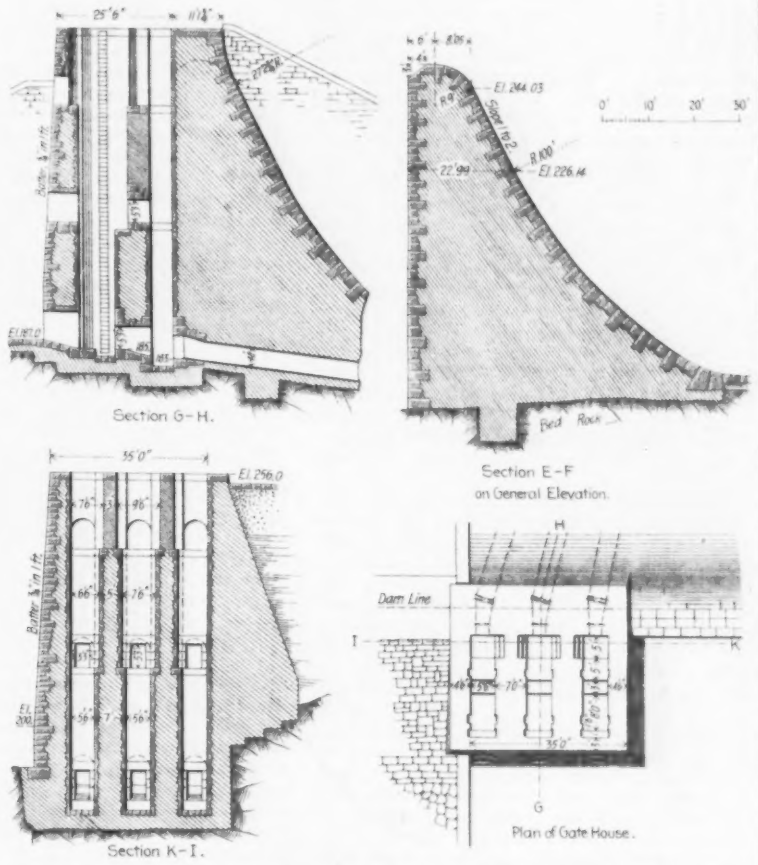
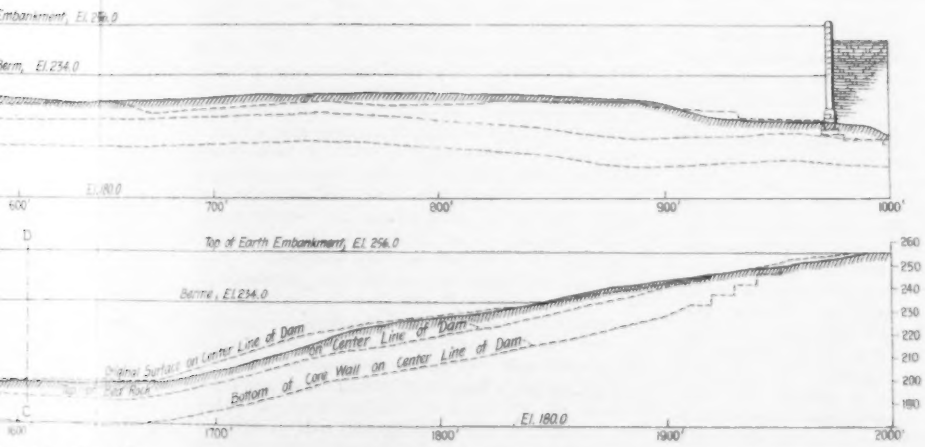


FIG. 5. DETAILS OF GATE HOUSE AND SECTION E-F ON GENERAL ELEVATION.


Top of Earth Embankment, El. 256.0
Berme, El. 234.0
El. 180.0
Original Surface on Center Line of Dam
Bottom of Core Wall on Center Line of Dam
El. 180.0

PS OF BED ROCK
F DAM.

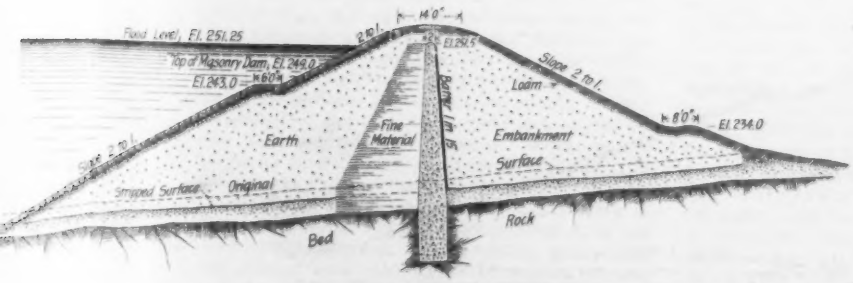


FIG. 3. SECTION A-B ON GENERAL ELEVATION.

DAM No. 5, AT SOUTHBOROUGH, MASS.,

ADDITIONAL SUPPLY

BOSTON WATER-WORKS.

Wm. Jackson, M. Am. Soc. C. E.,
City Engineer.

Desmond FitzGerald, M. Am. Soc. C. E.,
Resident Engineer.

CHAS. HART & SONS, LITH., 26 VESEY ST., N. Y.

them. These duties, as laid down, would make it very difficult and awkward for any person not properly trained and experienced to fill the offices. In many features this city charter is a marked advance upon the usual form of such documents; and not only engineers, but every citizen interested in the proper conduct of municipal affairs would be glad to see similar provisions for a proper division of duties and authority incorporated into other city charters.

CONCERNING THE NICARAGUA CANAL AND DARIEN CANAL ROUTES.

We note that two of the three members of the Engineer Commission to examine the route of the proposed Nicaragua Canal have been appointed. Col. William P. Craighill, Corps of Engineers, U. S. A., will represent the Army and be chairman of the commission, and Civil Engineer Mordecai T. Endicott, U. S. N., will represent the Navy. Both of these are excellent appointments, and Col. Craighill, with his long experience in government work and his reputation for thoroughness in all he undertakes, is admirably adapted to direct the movements of the commission. Mr. Endicott is second in rank in the Corps of Civil Engineers of the U. S. Navy, and has long been connected with the Bureau of Yards and Docks at Washington, and his experience will also be of great value in connection with harbor work and lock construction.

The name of the civilian engineer, to be appointed by President Cleveland, is not yet officially announced, though rumor has it that Mr. John Alexander Montgomery, President and General Manager of the Mary Lee Coal & Railway Co., of Birmingham, Ala., is slated for the position. Mr. Montgomery is about 44 years old, and from his general record is doubtless a man possessing executive ability and some knowledge of railway engineering. His experience of three years as a railway contractor may be valuable in estimating upon the probable cost of the work; but the President should select a man of broader training and experience, and of a wider professional reputation for so important a duty, to mate the able engineers appointed by the Secretaries of the War and Navy departments. The report of this commission should have a very marked influence upon the immediate future of the Nicaragua Canal, but every engineer upon it should possess the experience and general reputation necessary to carry full conviction along with his recommendations and official finding.

As we understand the purpose of this government commission, it is only authorized "to visit and personally inspect the route of said canal, examine and consider the plans and profiles, prisms and specifications for its various parts, and report thereon to the President on or before Nov. 1 next." For this purpose the sum of $20,000 is appropriated, and the verification of the quantities and estimates based upon the present route and plans is of sufficient importance to warrant this expenditure and the appointment of the best engineering commission available. But how about the route itself across Nicaragua? Is the line selected the best that can be found for the purpose intended? This is a question that the present commission cannot answer in the time specified and with the money available.

We believe that the country lying to the east of the proposed Ochoa dam, on the San Juan River, has been more thoroughly and intelligently explored than have been the environments of any other proposed canal between the Atlantic and Pacific, not even excepting the Panama Canal. But we also believe, from personal observation, that this territory requires more minute investigation before the best canal route can be settled upon than any other we know of. Owing to the enormous rainfall upon the Atlantic side, the hills forming the "divide" are cut up in the most eccentric forms and present an entangled series of very sharp crests, with exceedingly steep sides and deep valleys between. These valleys particularly are covered with the densest of tropical growth, and the timber growing in them has a trick of shooting up to an abnormal height in the search after sunlight. On the hills the trees do not attain a very great height, as the incentive mentioned is wanting, and they are more under the influence of the northeast trade winds. The result is that in overlooking the tree tops from any elevated point, and judging by the general level of the foliage, the explorer would suppose that the ground beneath was also practically level.

As every foot of the way has to be cleared by the Indian's machete before the engineer can test the true elevation of the ground, the natural difficulties in the way of a truly exhaustive survey of this country are easily recognized. In view of the fact that canal possibilities may yet lie hidden in some of these deep valleys, and upon the route adopted depend all the other important conditions of quantities, cost and future operating convenience, it would seem well for the government to make another and larger appropriation, and to send to Nicaragua the ablest unprejudiced commission and corps of engineers it can organize to test all these possibilities in the way of route over the section named. The cost should not be great, for the territory to be investigated is limited to the Atlantic divide; but the importance of this completer knowledge can be measured by the fact that on the present route across this divide the estimated cost of excavation alone, over a line about 1½ miles long, is over $12,000,000, or nearly 20% of the estimated total cost of the canal.

The Darien ship canal route, described in our issue of March 14, is discussed at length in a very interesting manner by Mr. F. W. Hurst, in our correspondence column. Mr. Hurst, however, by no means exhausts the list of surveys for ship canal routes across the Isthmus of Darien, and, in fact, he omits all mention of several of the later and more authentic surveys. Given in chronological order, and excluding the several very early and crude attempts to find a means for connecting the waters of the Atlantic and Pacific, the list of these surveys would stand about as follows: The survey of Domingo Lopez, in 1826, on a line between Panama and Portobello; the exploration made in 1827-'29, under the orders of Gen. Bolivar, covering about the same line, and which finally resulted in recommending a railway between Chagres and Panama, and the survey of the French engineers Garella and Courtines, in 1843, on a line running from Limon Bay, on the Carribean side, to the Bay of Vaca del Monte, on the Pacific, and including a 3.3-mile tunnel under the dividing ridge of Ahogayegna. In 1852 the government of Granada granted a concession to the Dr. Cullen mentioned by our correspondent, to build a ship canal on a line running from Caledonia Bay to the Bay of San Miguel, on the Pacific. But Mr. Hurst fails to mention that this line was resurveyed in 1870 by Capt. Selfridge, U. S. N., under the orders of the U. S. Government. Two lines were run by Capt. Selfridge, and the lowest summit found by him was 1,000 ft. above sea level, instead of the 150 ft. and 260 ft. of "cutting" claimed by Cullen and referred to by Mr. Hurst. A very complete survey was made in 1864, under the orders and at the expense of Mr. Frederick M. Kelley, a patriotic citizen of New York. This line crosses at the narrowest part of the Isthmus, between San Blas, on the Carribean Sea, and the mouth of the Chepo River, on the Pacific side. The route was only about 30 miles long from sea to sea, but it included a seven-mile tunnel under the axis of the Cordilleras. In 1865 M. de la Charme surveyed a line crossing from the south part of the Gulf of Darien to the Bay of San Miguel, via the River Tuira; and in the same year M. de Puydt, an engineer in the employ of the French International Colombian company, announced that he had found a more favorable passage still from the port of Escondido to the Tuira River, and thence to San Miguel. These latter routes practically cover the line advocated lately by Mr. Karwiese and shown in our issue of March 14. But both of them were examined in 1871 by Captain Selfridge and pronounced impracticable by that officer. No mention need be made here of the unfortunate exploring expedition of Lieut. Strain, of the U. S. Navy, in 1856, nor of the extreme southern line, by way of the Atrato and Napipi rivers. The next surveys of any consequence were those of 1876, '77 and '78, conducted under Lieut. Lucien N. B. Wyse and Gen. Etienne Turr, which finally culminated in the de Lesseps Panama Canal and the disastrous and malodorous enterprise with which all are familiar.

All accounts seem to agree that the interior of the Isthmus of Darien is still a practically unknown region, much cut up by mountain ridges and spurs of the Cordilleras, and so heavily wooded and obstructed by tropical growth that any complete survey of the region between Panama and the Gulf of Darien means the outlay of much more time and money than has yet been expended upon it. But it is also a fact that wherever any late and intelligent surveys have been made on the lines of proposed ship canals across Darien, the axis of the Cordilleras has invariably been encountered with such an elevation that a tunnel forms a necessary part of a ship canal scheme. In other words, the claims of Cullen and other parties referred to by our correspondent, setting forth the existence of low passes on these lines, have been long ago exploded. What may exist in the way of low summits and favorable routes in the nearly 400 miles of mountain range extending from Panama to the southern part of the Gulf of Darien, no one can positively say, on account of the lack of information. This isthmus, as being the narrowest strip of dry land between the two oceans, is a tempting field for investigation in connection with the study of interoceanic canals, and has attracted investigation, with this end in view, since the days of Philip II. But before spending much more money and time in hunting up possibilities in Darien, every more northern route should first be exhaustively studied. The ultimate commercial use and convenience of a ship canal between the Atlantic and Pacific demand that it be located as near as possible on the general line of traffic, and this lies far north of Darien, or, in fact, of any of the proposed lines. Even the difference between the Nicaragua and Panama routes for ship canals means an excess of about 1,000 miles of useless sailing for the latter route, and any location south of Panama adds to this figure and approaches nearer to the belt of unfavorable winds on the Pacific coast. This commercial consideration must be studied in connection with the first cost of the canal, length of route, time of transit and favorable harbor and wind conditions. It should be understood that any canal across this isthmus must be an American canal, and the needs and convenience of the United States are of the first importance in any location.

LETTERS TO THE EDITOR.

EVAPORATIVE CONDENSERS.

Sir: I note with much interest your editorial on the cooling of hot water, and the application of the principle to condensers. The late Jas. H. Fitts, formerly Professor of Mechanical Equipment at this place, devised a condenser based upon that principle, a description of which will be found in Trans. Am. Soc. M. E., Vol. XIV., p. 690 (also in Eng. News, Aug. 10, 1893). From the tests reported there, it would seem not improbable that an apparatus of comparatively small cost could be devised which would use its own condensed steam for condensation, and that a condensing engine could be run with approximately the same amount of water for both steam and condensing water, as the same size engine would require when run non-condensing. In other words, a non-condensing engine could be run (with its present water consumption) condensing. Very truly yours,

L. S. Randolph, M. Am. Soc. M. E.,
Professor of Mechanical Engineering, Virginia Agricultural & Mechanical College.

Blacksburg, Va., March 23, 1895.

THE OFFICE OF WATER PURVEYOR IN NEW YORK.

Sir: Referring to your editorial in the issue of March 28, in which you so highly indorse the appointment of Mr. E. P. North to the important position of Water Purveyor in the Department of Public Works, a commendation in which all practical and business men will agree, you have made a slight misstatement. During the present generation Mr. North has had an engineer as a predecessor in the position, when it was held by the late D. Lowber Smith, M. Am. Soc. C. E., afterwards successively Deputy Commissioner and Commissioner of the Department. Commissioner Smith took the full course and graduated with high honors in the Ecole Polytechnique, of France, and was considered by many one of the most able engineers of city works in the United States. Yours very truly,

T. Hugh Boorman.

New York, March 29, 1895.

(We thank our correspondent for the correction.—Ed.)

CONCERNING DARIEN SHIP-CANAL ROUTES.

Sir: I notice in your valuable journal of March 14, page 162, an article entitled "A New Darien Ship Route." As there is just now considerable interest in this Isthmian canal question, allow me to state that for some time past I have been advocating a route for a ship canal across the Isthmus of Darien (or Panama) from Port Escoces, or Caledonia Bay, on the Atlantic side, to the Gulf of San Miguel, on the Pacific side, via the Savana River.

This route has been highly recommended by Dr. Edward Cullen, F. R. G. S., in his interesting work "The Isthmus of Darien Ship Canal, with a Full History of the Scotch Colony of Darien," with maps, views and original documents. Second edition published in 1853.

I find, commencing at p. 14, that he says that Caledonia Bay, Port Escoces and the channel of the Sasardi, on the Atlantic side, have an extent of 11 miles of safe anchorage in all winds and great depth of water. The Gulf of San Miguel, on the Pacific, would hold the shipping of the world. The advantages set forth are as follows: Excellent natural harbors, as above; no locks necessary; no dams required; only a simple cut, and the distance across Darien is only 39 miles. The greatest depth of cutting is 150 ft. for scarcely two miles, and the canal to be cut would be from 25 to 30 miles long. With a proposed depth of 30 ft. no dredging or deepening of rivers would be necessary. Capt. Fitzroy thinks transit could be effected in six hours, on one tide. These coasts are peculiarly exempt from storms and hurricanes, and there are no volcanoes within some hundreds of miles, and no indications of their previous existence.

In Clyde's Geography, under the head of "Isthmus of Panama," is found the following: "The Isthmus contains also the two shortest routes that have yet been proposed for ship canals between the Atlantic and Pacific. One of these is by the River Chagres to Panama. This route is 52 miles long; but the other, called the Darien route, from Port Escoces to the Bay of San Miguel, is shorter by 12 miles. The height of the watershed is not more than 260 ft. It appears that the tide rises 23 ft. in the Gulf of Panama, while that in the Carribean Sea is scarcely perceptible, and at mid-tide the waters on the two sides are on the same level. This would give a current both ways running 3 miles an hour, which would scour the ship canal and aid the passage of vessels."

Chambers Encyclopaedia, under the heading of "The Darien Scheme," refers to the disastrous Scotch colony founded in Darien by William Paterson, President of the Bank of England, in 1695. Five ships and 1,200 men set sail from Leith, on July 25, 1698, and landed at and gave a name to Port Escoces. A Panama canal was included in the scheme of the far-seeing projector. The books and other documents relating to this company "are preserved in the Advocates Library."

Lionel Gisborne, in 1852, published "Gisborne's Darien Journal," a record of an inquiry into the "Junction of the Atlantic and Pacific Oceans." He says: "May 22.—I have just had put into my hands a map of Darien, published in New Orleans, by Dr. E. L. Autenreith. The interior is filled up with rivers and summit ranges, and as far as I can compare it with coast charts, it appears very accurate. It is remarkable that between the Gulf of San Miguel and the Atlantic coast the internal geography corresponds almost exactly with the rough map given by Dr. Cullen, and compiled, he says, from personal observations. This map is the only contradiction I have met to the many authorities who describe the interior of Darien as one unexplored region, since the time of the Buccaneers, whose accounts are the only authentic ones of the Isthmus ever having been crossed by white men."

In the "Proceedings of the Royal Geographical Society of London," Vol. I., Sessions 1855-56 and 1856-57, is a notice of a late exploration of Darien by Dr. H. C. Caldwell, of the U. S. frigate "Independence," communicated by John Power, Esq., F. R. G. S., of Panama. An expedition was made to the Gulf of San Miguel for the purpose of reporting upon the facilities for obtaining lumber for ship building. Dr. Caldwell accompanied the expedition, and from Mr. Andrew Hoseac, of Chepigana, he learned the particulars of the explorations made by Dr. Cullen, Mr. Gisborne, Capt. Prevost, R. N., and Lieut. Strain, U. S. N., in 1853. It was Mr. Hoseac's opinion, based upon information derived from the Indians, that there existed a comparatively level tract of land between Fort Principe, on the Savana River, and Caledonia Bay on the Atlantic, in a direction more northerly than that followed by Capt. Prevost, of H. M. ship "Virago," in 1853.

In the Journal of the Royal Geographical Society, Vol. XXIV., 1854, is an official report of the exploration under Commander J. C. Prevost, R .N., with a map showing the route he followed across the Isthmus of Darien. He did not go fully across to the Atlantic; but in connection with Lionel Gisborne, C. E., a line appears to have been struck clear across, from Darien harbor, near the Gulf of San Miguel, to Caledonia Bay, on the Atlantic side. The highest elevation seems to be 1,020 ft. Yours respectfully,

Thomas Wright Hurst.

1294 Wilcox Ave., Chicago, March 21, 1895.

PRESERVATIVE COATINGS FOR STEEL PIPE ON THE ROCHESTER WATER-WORKS.

Sir: In your issue of Feb. 7, 1895, there appeared an article on "Preservative Coatings for Iron Work," by Mr. A. H. Sabin. Feeling that there is a misunderstanding somewhere, I should like to say a few words on the subject from practical experience on the Rochester pipe line, of which Mr. Sabin speaks. I was in close relation to the handling of the whole 27 miles of the 38-in. steel pipe for the Rochester conduit, having been placed in charge of the pipelaying soon after work was started. Each length of pipe was examined inside and out just before it was laid, and all places where the paint had been broken off were cleaned and painted with "P. & B." paint. This preservative gave the very best results, even when exposed for several months on pipe lying in the field during a severely cold winter. Yet this is one of those quick-drying paints regarding the life of which Mr. Sabin expresses such a poor opinion.

No matter how good a paint may be, it is useless if put on in a careless manner. As Mr. M. P. Wood, M. Am. Soc. M. E., practically says in his paper read at the recent New York meeting of the American Society of Mechanical Engineers (see Eng. News, Jan. 31, 1895), what is wanted is not so much a new coating as a new way of applying the coatings. That is to say, the steel should be more thoroughly cleaned before the application of any paint.

As regards the Maltha coating used on the first 13 miles of the Rochester pipe line, what Mr. Sabin says must be admitted, that great care and judgment must be used in maintaining the bath at the proper consistency. Indeed, most of the coating that was done after the scraping of which Mr. Sabin speaks was of a firm, tough nature, adhering very closely to the metal. The statement made by Mr. Sabin to the effect that 20% of the original coating was broken off in the handling of the pipe may be left to the judgment of the readers, after presenting the following facts: The contractors laid from 500 to 1,000 ft. a day, and even as high as 1,500 ft., which would give a coated surface of 10,000 to 30,000 sq. ft. Practically all the repainting was done by two painters before the pipe went into the trench. Taking 20% of the coated surface gives 2,000 to 6,000 sq. ft. of surface to be painted by two men, a rather good day's work when it is further understood that these men not only painted, but cleaned out, all the pipes.

Mr. Sabin admits that the old-time coatings for cast iron pipe were good, and intimates that the trouble now is that the quality of material is not what it used to be; but he continues to say that the materials in his coating must be of the best, or the good results will be lacking. Then, if the materials can be had that are honest to be used in his coating, why not in coatings similar to the old ones? Those used 20 years ago show themselves to be very enduring. I know of an old wooden stave pipe which was dug up after some 20 years of burial, the iron bands of which had the original coating in good condition, showing but small progress of rust. So also with the 24-in. cast iron pipe of the old conduit of the Rochester waterworks, of which the writer examined some 100 ft. and found that under a good flow the rust had not collected to any great extent inside. It was also to be seen that where the pipe was so located as to become rusted the largest tubercles, 2 ins. in diameter and ½ in. thick, were entirely from an opening in the coating not larger than a pin. This suggests the chief cause of complaint against Mr. Sabin's new coating, that practically renders it more dangerous than a heavier preservative; the new coating is so thin that when small breaks develop in it, as they did in handling, they were so small, usually the size of a pea, that the painters would continually pass them over.

As to the great ease and simplicity with which this japan may be put on, I have my doubts, as experience shows that quite as much care must be exercised as in the coating with the Maltha or other asphaltic compositions. Over 200 of the pipes coated with japan by Mr. Sabin's process had to be scraped and repainted where the pipe was half bare, in streaks from top to bottom, though at a distance appearing to be properly coated. In fact, the bare places did not reach the writer's eye until the final close inspection preparatory to going into the trench, when those ahead were closely examined and a gang of painters at once set to work. These defects were evidently due to the decomposition of the paint during the period of baking, when the attendants had become a little careless. We all know that unskilled labor is at any time liable to become thus careless, no matter how important the case may be.

Although, as a rule, the japan coating was a beautiful example of what could be done, this one bad stretch served as an object-lesson in showing that no coating has yet been discovered where the whole operation can be safely left to unskilled labor without close supervision.

In making the statement that not one of the pipes coated by the japan process had to be recoated, it is evident that Mr. Sabin had relied more on his own judgment than on close inquiry.

Another interesting point brought out by the digging up of the old cast iron pipes is that where the pipes were in sand they were much more rusted than those in clay. Apparently the sand held the pipe open to the air, while the clay practically sealed it.

Very truly yours,

Willard D. Lockwood, Jun. Am. Soc. C. E.

Rochester, N. Y., March 9, 1895.

(The above letter was referred to Prof. Sabin, who has replied as follows:—Ed.)

Sir: Mr. Lockwood's letter gives occasion, of which I am glad to avail myself, for correcting a couple of mistakes which I made in my address before the New England Railroad Club, and which, while not very serious, ought to be corrected.

First, as to the statement that none of the pipes had to be recoated. I did not suppose that any one understood me to say that none of them ever had to be retouched by paint, for in repeatedly handling thousands of pipe sections, weighing on the average about two tons each, it would be wonderful if some of the coating were not scraped off. What I did mean to say was, that it had not been necessary to re-dip and rebake any of them. I was rather anxious about this at first, but while some of the first sections coated did not look quite as well as they should, they proved to have a good substantial coating, and after a while I ceased making inquiries about it, thinking I would hear of it if anything went wrong. I never did hear so, and I assumed that no trouble was experienced. In this I find I was wrong. Several sections had to be recoated, for the following reasons: The greater number of them because the careless teamsters dumped them in the wrong place, and then, instead of reloading them, hitched a trace chain into the rivet holes and dragged them over the frozen gravel to the place where they belonged. The teamsters were dismissed for this, and the pipe recoated at the expense of the contractor, but it was not reckoned a fault in the coating process and was not reported to me. In the other case there were some sections, about half or a third of an ovenful, which were not baked enough; it was surmised that this was due to one of the oven doors not being properly closed and thus reducing the temperature. These had to be rebaked, but it was not reckoned a serious matter, and was not reported to me at the time. I am glad to make the correction.

The second correction I would make is in regard to the obstruction of the old Rochester main. In the first place, this is not to be accurately described as a 30-in. pipe, part of it being somewhat larger and part of it smaller than that size, the size varying according to the inclination of the pipe; and the obstruction amounted to 25% instead of 50%, as I said. Cases are on record where the obstruction amounted to 50%, and I heard that this was the case at Rochester, but I have been corrected by Mr. Kuichling, who is the final authority in this case.

As to the abrasion of the Maltha-coated pipe amounting to 20%, that estimate was based on my own observation and that of more competent and disinterested observers. I did not see all of it; some of it was not so bad as that and some of it was worse. But Mr. Lockwood and I are talking of different things, for he speaks of the pipe before it went into the ditch and I of the pipe after being ditch-riveted and used for some time as a sidewalk. I went through and over a lot of that pipe, and I don't think I exaggerated the condition of things.

I have no protest to make against Mr. Lockwood's criticism of my coating, that the defects in it are so minute as to almost elude inspection; that remark, while doubtless true, does not cause me much uneasiness. And I am so well in accord with his opinion as to the importance of skilled supervision during the process that we shall hereafter have one of our own trained men constantly present when pipe is being coated; we now have such an inspector at Cambridge, Mass., where we are coating 23,000 ft. of 40-in. pipe, and we shall have one or more on the job for Allegheny, Pa., where we are to coat nearly ten miles of 60-in. pipe. There is no place where greater care should be used than during the process of coating.

New York, March 23, 1895. A. H. Sabin.

NOTES AND QUERIES.

The A. C. Co., of Boston, Mass., queries as to late published observations upon the expansion of large stone domes. Work of this character is so rare in the

United States that we can find no data upon this head; and the older descriptions of European stone domes fail to discuss or mention this feature in their construction. If any of our readers can furnish personal information or refer to any late intelligent investigation of the expansion in stone domes they will confer a favor by forwarding such material to this journal.

A. H. N. asks for published tests of the strength of welded wrought iron pipe and of seamless drawn brass pipe, iron pipe size. He also inquires whether "galvanizing affects the strength of iron pipe." Tests of lap-welded iron pipe for steam pipe 8 ins. and 11¼ ins. in diameter were made by the Fairfield Shipbuilding & Engineering Co. in 1891 (London "Engineering," Oct. 30, 1891). In these tests 11¼-in. pipe burst under a hydrostatic pressure of 3,100 lbs., while the 8-in. pipe failed at 2,800 lbs. The smaller sizes of either, iron or brass pipe (to which, we judge, A. H. N. more especially refers), will stand an enormous internal pressure without bursting. Some of the manufacturers should be able to refer him to tests. Galvanizing reduces the strength of wire, and probably has some effect on the strength of iron pipe, though it seems unlikely that the effect would be great enough to make it of much practical importance.

CONCRETE AND STEEL WIRE FLOOR, LINCOLN PARK BRIDGE, CHICAGO.

We illustrate in the accompanying cuts a general view and details of the solid floor system of a 180-ft. span footbridge built across the "Lagoon" in Lincoln Park, Chicago, in 1894. This structure is of cantilever type, and was built with a curved bottom chord to give it a more handsome appearance and increase the head room, so as to permit of the passage of dredges from the harbor into the lagoon. The two approaches are each 90 ft. long, and their construction is in all respects similar to that of the main span, which is clearly shown by Fig. 1.

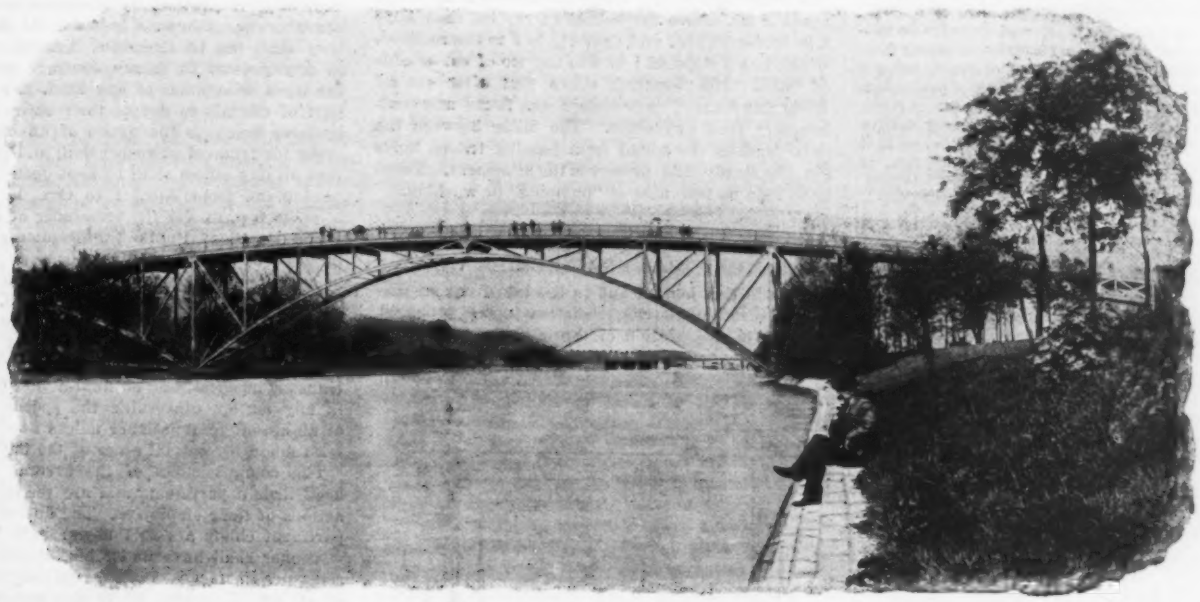


FIG. 1. VIEW OF CANTILEVER FOOT BRIDGE AGROSS LINCOLN PARK LAGOON, CHICAGO. W. L. Stebbings, Chicago, Chief Engineer.

The principal point of interest in this structure is the solid concrete and steel wire floor system, which is shown in Fig. 2. As will be seen from the drawings, the floor beams are placed at the panel points 18 ft. apart, there being at the center of the span two beams placed near together, with the expansion joint between them. Beginning at each of these center beams a series of two groups of four steel wires each is carried back over the intermediate floor beams toward each end of the span. One group of wires is stretched along the line A, B, C, D, E, while the other group is stretched directly above along the line A, C, E. The vertical planes passing through these groups are 1 ft. apart horizontally in a direction transversely across the bridge, as shown in the transverse section. These groups of wires were filled around with concrete, as is also shown by the transverse section.

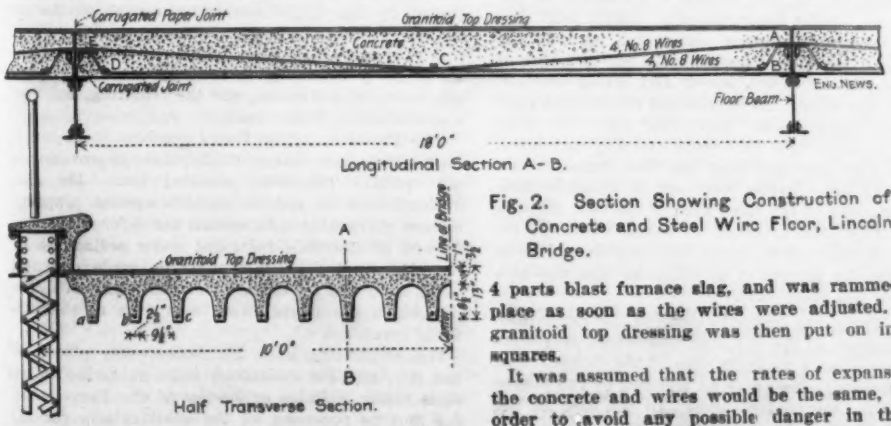


Fig. 2. Section Showing Construction of Solid Concrete and Steel Wire Floor, Lincoln Park Bridge.

The method of construction was as follows: The falsework had a longitudinal wooden joist directly under each of the points, a, b, c, etc. These joists were covered with boarding, and on this boarding were placed the forms for making the corrugations. The groups of wires were first stretched into place under a tension of 60 lbs., and fastened into their proper position by hook bolts fastened underneath the wooden joists. These hook bolts were so constructed that they could be removed when the concrete filling was firmly set. This concrete was composed of 1 part Dyckerhoff Portland cement, 2 parts fine torpedo sand and 4 parts blast furnace slag, and was rammed into place as soon as the wires were adjusted. The granitoid top dressing was then put on in 6-ft. squares.

It was assumed that the rates of expansion of the concrete and wires would be the same, but in order to avoid any possible danger in this direction, a strip of ordinary corrugated paper was placed between the concrete and the floor beams, as shown by the drawings. To obtain some idea of the adhesion between the concrete and the wire, two No. 8 galvanized steel wires were embedded in a 6-in. cube of concrete. These wires were perfectly straight, and passed entirely through the block. The concrete was taken from a batch being used on the bridge, and no especial care was taken in making the block. The blocks were allowed to harden in the weather, and were then removed to a dry basement, where they were kept until tested at an age of three months. The following is the result of the tests:

	Pull per lin. in. before elong., lbs.	Ultimate pull per lin. in., lbs.	Slip of wire, ins.
First test.....	51	65	1½
Second test.....	45	67½	1

In designing this floor it was assumed that the wires would take all the tensile strain, while the concrete in the top part of the beam would take the compression. The bridge has now been in use nearly a year, and the floor has withstood the traffic perfectly. Although the conditions were such that the cost of this floor cannot be accurately obtained, we are informed that a similar floor could probably be built for 25 cts. per sq. ft. The patentee of this system of floor is Mr. M. F. McCarthy, of Chicago. The bridge was designed by Mr. W. L. Stebbings, Monadnock Block, Chicago, and all the work carried out under his direction. We are indebted to Mr. Stebbings for the matter from which our illustrations have been prepared. The contractors for the iron work were the Pittsburg Bridge Co., Pittsburg, Pa.

THE DESIGN OF FREIGHT CAR DOORS.

The following is an abstract of a paper on "Car Doors," presented by Mr. H. H. Perkins, at the March meeting of the Central Railway Club, Buffalo, N. Y.:

The number of box cars in use in this country is about 512,000, without counting those of private owners, not included in the equipment of railways, which would add several thousand. This shows considerably over 1,000,000 car doors.

In practice, frequently 10 to 20 doors must be closed in five minutes, particularly when a switch engine appears to draw a train from alongside a freight house, and as the general rule is to allow only one seal press at a station, some one has to hustle with it to prevent too serious delay to engine and business. Way freight men want and need a door that can be handled easily either from the ground or platform, as often additional minutes at some station may cause hours of delay on the road. Many times men have been seen to get hurt or just escape a severe blow on the head, when trying to open or close a door hung by hooks on a slide-bar either at the top or bottom. When such doors have been in use some time and the strip on top is worn, they are very liable to let go very suddenly, and a man has to jump from under to save himself from injury. When doors hung this way are old and the bolts loose, often the door hangs by one corner, and is very difficult, sometimes impossible, to replace with the conveniences at hand, and there it swings, while the car is being switched, occasionally causing broken switch lamps, if not men's broken heads. The door of which the least complaint is heard among freight handlers is that hung on rollers or pulleys at the top, with "

projecting door guides below the bottom of the door, and wedge-shaped pieces on the bottom of the door to fill guides when the door is closed. These wedge-shaped pieces project about an inch; I would suppose ½ in. would be sufficient. These doors always work well, even when bolts that hold the pulleys to the door are loose, or the door gets old or shaky. Some arrangement whereby the pulleys could be oiled occasionally would be an improvement, but altogether, freight men are well satisfied with doors hung this way, and if made a few inches wider than the ordinary doorway, the lap over the doorpost at the back, and the door stop in front, make the necessary protection against sparks and rain. For convenience, fastenings should be located about one-quarter the distance from bottom to top. This permits, on either ground or platform, the seal to be examined conveniently and expeditiously, and the examination of car seals has to be done by too many employees, and too often, and is of too great importance to be made more difficult than necessary. For all practicable purposes is it necessary to have an expensive patent fastening? The hasp holds the door in its place, the pin secures the hasp, and the seals furnish the protection. A door convenient for all the details of the business in which cars are used is what is earnestly desired by those who use the cars, and it does not follow that a convenient door must be either unsafe, imperfect, or expensive.

SOLID FLOOR TRESTLE; HOUSTON & TEXAS CENTRAL R. R.

The constant danger of fire on wooden trestles from sparks or cinders from engines passing over them has led some roads to adopt ballasted floors for these structures, and we illustrate herewith the standard type of trestle of the Houston & Texas Central R. R., Fig. 1, which has been in use for several years and has proved satisfactory.

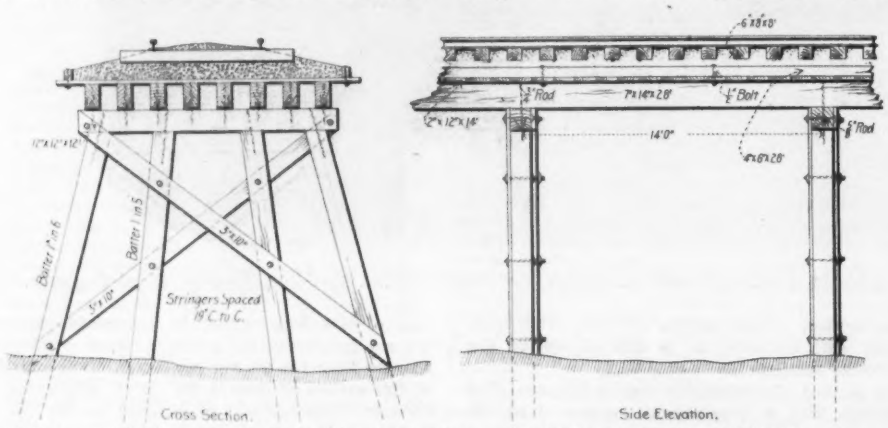


FIG. 1. TRESTLE WITH BALLASTED FLOOR; HOUSTON & TEXAS CENTRAL R. R.

The trestle is of creosoted pine timber, of the usual construction, with bents 14 ft. c. to c., but on the caps are eight lines of stringers, 7 × 14 ins. and 28 ft. long, supporting a floor of transverse planks 2 × 12 ins. and 14 ft. long, along the ends of which are bolted timbers, 4 × 6 ins. and 28 ft. long, to retain the ballast, which is filled in over the middle of the ties and is 10 ins. deep under the ties. By this arrangement the danger of fire is avoided, and the work of the bridge gang decreased, as the track can be lined and surfaced by the regular section gang. The trestles are built at an average cost of $8.50 per lin. ft. Mr. F. B. Goodrich, Assistant Engineer, to whom we are indebted for blueprints, etc., says that he considers these structures to be permanent, basing his opinion on the experience with creosoted timber on this road, as creosoted pine ties, which were laid 22 years ago last April, are now in good condition. It may be noted that the blueprints show no longitudinal diagonal bracing, and, if this is not provided in construction, it is a serious omission, as noted in regard to the fallen trestle described in our issue of Jan. 31.

Fig. 2. Standard Cross-Section of Track; Houston & Texas Central R. R.

The Southern Pacific Ry. has ballasted culverts with solid floors of timbers, 10 x 12 ins. and 16 ft. long, laid close together upon the caps and having a 4 × 6-in. coping strip along each side, to retain the ballast. On the Richmond, Fredericksburg & Potomac Ry. a plan adopted to protect the floors of trestles and culverts from fire is to fasten between the ties boards 2 or 3 ins. thick, and as wide as the tie spacing, and similar boards along the ends of the ties, forming troughs, which are filled with gravel. The durability of the stringers is not affected, and the arrangement is considered preferable to the open floor.

The cross section of roadbed and ballast shown in Fig. 2 is chiefly noticeable for the manner of filling in the gravel ballast between the rails, it being filled in to the under side of the rail heads. From the inner edge of the flange the ballast is sloped to about 2 ins. above the bottom of the tie, then slope 1 in 18 for 18 ins., and then 1½ to 1 to the roadbed, which has a slope of 1 in 6 to the toe of cut or edge of bank. Mr. Goodrich states that after several trials this form of cross-section was found more satisfactory than any other. The filling between the rails deadens the sound from passing trains, holds the ties steady, and preserves the alinement. There have been no instances of "pumping" or washing.

THE ST. LOUIS SYSTEM OF CONTROLLING MUNICIPAL ENGINEERING WORK.

Both in this journal and in the late frequent discussions in engineering societies upon proposed changes in the relation of the engineer to the municipal government, the practice of the cities of Providence and St. Louis in this respect has been frequently referred to as embodying advantageous features. The Providence system was quite fully explained in our issue of Dec. 6, 1894, and the St. Louis plan is given here in the form of an abstract from its charter of the sections more particularly relating to the engineering control.

The Mayor of St. Louis is elected for four years, and with him is also elected a President of the Board of Public Improvements, which body has under its control all the engineering work of the city. But the Mayor appoints the six members of this board, the street, sewer and water commissioners, the wharf and harbor and the gas and park commissioners. These men hold office for four years, or until their successors are duly appointed, and it was provided that the first appointments under the new charter were not to be made until the beginning of the third year of the new Mayor's rule. This was intended to avoid wholesale removal of department heads and employees just at the time the system of government was changed, but does not apply now.

The Mayor has power to suspend, for cause, any elected officer of the city, and this official may then be removed by a majority vote of the Council; and any appointed officer may be removed by the Mayor or by the Council for cause. In the case of the elected officer, if the majority of Council agree with the action of the Mayor, the suspended officer is removed and a new election ordered; if the majority does not agree with the Mayor, he is at once reinstated. When the Mayor removes an appointed official, he notifies Council of the removal and its causes, and that body elects a suitable person for the place; but the Mayor can also remove this elected officer, if he sees cause for so doing. If the majority of the Council remove an official appointed by the Mayor, the Mayor must fill the vacancy without the confirmation of the Council. But all appointments made by the Mayor require confirmation by a majority vote of the Council; and if this body fails to confirm within ten days, the Mayor nominates another person, and continues to do so until he finds a man agreeable to both parties. If the Mayor fails to make another nomination within ten days, the Council then elects an officer for the term.

All elected and appointed officers must have been citizens of the United States and of St. Louis for at least two years, and must be able to read and write the English language. They must not, at the time of their election, be in arrears to the city for taxes or be otherwise indebted to the city, and they shall not be interested directly or indirectly in any present or future contract with the city for work or supplies of any kind. Failure on the part of officials to devote their entire time during business hours to the duties of an office shall be cause for removal or suspension; and it is provided that all city offices shall be kept open from 8 a. m. to 6 p. m. from April 1 to Oct. 1, and from 9 a. m. to 5 p. m. for the remainder of the year.

The Board of Public Improvements is required to meet at least once in each week in its office to consider and take action upon such business as may come before it. It must furnish, through its President, to the Mayor, or either branch of the Municipal Assembly, such data and information as may be required. A majority of this board can transact business, but no final action can be taken in any matter concerning the special department of an absent commissioner unless this business has been made the special order of the day.

The commissioners of the several departments head their departments and are responsible for all actions of their employees. The duties of these department chiefs are as follows: The Street Commissioner shall have under his especial charge the construction, reconstruction, repairing and cleaning of all public streets, alleys and places, excepting parks. The Sewer Commissioner has charge of the construction, repair and cleaning of all public and district sewers, inlets, manholes and other appurtenances. The Water Commissioner has charge of the pumping machinery, reservoirs, water pipes and other property connected with the water-works. He superintends the enlarging of the works and the laying of water pipes, and has a general supervision of the water-works department, excepting the collection of water rates. The Harbor and Wharf Commissioner has charge of the construction and repairs of dykes, wharves and levees, and is charged with the execution of all ordinances of the city relating to dykes, wharves, levees, steamboats and all other vessels and rafts. He also furnishes the Collector such data as will enable him to collect all dues from boats, vessels and rafts. The Park Commissioner controls all the public parks and squares of the city, excepting such as are excluded by the City Charter or special provisions in the territory of other commissioners. The Gas Commissioner has charge of and controls all property belonging to the city gas-works, and the laying of gas mains, and the repairing, lighting and cleaning of street lamps.

The President of the Board presides at all meetings and he has charge of all public improvements not specially otherwise provided for. He also authenticates all special tax-bills against property owners chargeable with special taxes for work performed or materials furnished under ordinances of the city; and these bills must be made out and certified to him by the head of the department under which the special work was done or the material furnished.

Before entering upon his duties every officer of the city, and his assistants, must subscribe to an oath before a Judge or Justice of the Peace, stating that he possesses all the qualifications for his office required by the charter, and that he will support the Constitution of the United States and the state of Missouri, and the charter and ordinances of the city of St. Louis, and faithfully demean himself in office.

The chief of every department must report an-

nually to the Mayor, and also as often as a report may be required of him. He must report quarterly to the City Comptroller a full itemized account of all the money received and paid out by or through his department. The report of the Board of Public Improvements, at the opening of each stated session of the Municipal Assembly, shall set forth in detail the condition of the public works of the city under appropriate headings, and description of each contract, the names of contractors, the authority for and amount appropriated to each piece of work or contract, the amount paid thereon prior to the last annual report, the amount since, and an estimate of what is necessary to complete the work. This report shall also state how much, for what purpose, and under what authority expenditures have been made without written contract approved by the Assembly, and all other things in the departments of interest to the administration or to the public.

Under the head of detail of administration of the Board of Public Improvements, street openings come first. The Assembly, by ordinance, established a general plan for the location and grading of city streets, and in all subdivisions of property afterwards made the owners must conform to this general plan. In all cases where new streets or public grounds are laid out, or donated to the city, the plan of these streets, etc., must be submitted to and indorsed by the Board of Public Improvements before it can be recorded to have any validity The Recorder of Deeds is required to enforce this clause before any sale of land can be made. The general plan provides that no streets running east and west can be less than 220 ft. apart, except in certain excepted cases, and no north and south streets shall be less than 500 ft. apart. The section relating to the condemnation of property for city use is lengthy; but it is sufficient here to say that after due notice has been given to all interested parties the Court appoints three disinterested commissioners, freeholders of city property and residents of five years' standing, to assess damages. It is made the duty of these commissioners to ascertain the actual value of the land and property to be taken, without reference to the projected improvement, and the actual damage to the property thereby; and for the payment of such values and damages to assess against the city the amount of benefit to the public generally, and the balance against the owners of property which shall be especially benefited, to the amount that each lot shall be benefited by the improvement. The sums to be paid by the owners of property especially benefited shall be a lien on the property so charged, and shall be collected as provided by ordinance. When collected this money is paid into a separate fund in the city treasury, to be used exclusively for the payment of damages awarded. It is provided, however, that in the opening of an alley the benefits shall be paid by the owners of property in the block abutting on the proposed alley.

No ordinances for the construction or reconstruction of any street, alley or public highway can be passed unless recommended by the Board of Public Improvements. In case of any petition by reputable freeholders for the opening of a street, the Board will give a public hearing, after two weeks' notice in the public press, and then consider the proposed improvement. If the Board approves, it shall prepare an ordinance and forward it to the Assembly. These ordinances shall specify the character of the work, its extent, the materials to be used, the manner in which it is to be built, and the fund out of which it is to be paid for. An estimate of cost must also be submitted. A two-thirds vote of the Municipal Assembly is required to order the making of an improvement recommended by the Board, but accompanied by a remonstrance by freeholders; in other cases a majority vote is sufficient.

The ordinances for the repair and cleaning of streets, etc., and for the construction of crosswalks must be prepared and recommended by the Board, and no ordinance can be passed without this recommendation.

The cost of construction in these proposed improvements is proportioned as follows: The grading of new streets, alleys and highways and the cleaning of the same, are paid out of the general revenue of the city; the paving, curbing, guttering, sidewalks and the materials for the roadway, and the repairs of all alleys and sidewalks, are charged upon the adjoining property, as a special tax and collected as provided. When the estimated special tax assessed against any property exceeds in the aggregate 25% of the assessed value of such property, calculating a depth of 150 ft. for the property, then the Assembly shall provide out of the general revenue for any amount in excess of the 25% of assessed valuation.

A new sewerage system was established with the new charter, dividing the sewers into three classes: public, district and private. The public sewers are those established and built along the principal courses of drainage; district sewers lie within the limits of districts prescribed by ordinance and approved by the Board; private sewers, connecting with the public and district sewers, may be built under established restrictions, but the city is at no expense in constructing or cleaning them.

The Municipal Assembly has no power, under this charter, to directly contract for any public work, nor to fix the price or rate therefor. But the Board of Public Improvements in all cases, except in cases of necessary repairs requiring prompt attention, is required to promptly prepare and submit to the Assembly estimates of the cost of any proposed work, and under the direction of the ordinances shall advertise for bids and let by contract to the lowest responsible bidder, subject to the approval of the Assembly. Any other mode of letting is illegal and void. No security on any bond shall be taken, unless the surety shall pay taxes on property equal in amount to his liability on all bonds of the city; and no contract can be made without a bond for its faithful performance, with at least two sufficient sureties.

Every ordinance requiring work to be done must contain a specific appropriation from the proper revenue and fund, based upon an estimate of cost indorsed by the President of the Board of Public Improvements for the whole cost of such street, part of street or other work contemplated. Every contract must also contain a clause to the effect that it is subject to the provisions of the charter in this respect, and that aggregate payments thereon are limited by the amount of the specified appropriation, and that on ten days' notice the contract may be suspended without cost to or claim upon the city.

Street sprinkling is paid for out of a special tax assessed upon the property bordering the streets sprinkled, and this tax is in the proportion that the linear foot of fronting lot bears to the total number of linear feet of all property in a contract district chargeable with a sprinkling tax. The sprinkling is contracted for annually by the Board of Public Improvements, and the assessed taxes become a lien on the property benefited. The cost of the sprinkling is paid out of the city treasury to the contractors. The sprinkling season commences on March 15 and ends on Dec. 1.

The administration of the water-works of St. Louis includes no features that need noting here, the practice being about the same as in other well-regulated city governments; and the same remark can be made concerning the department of public parks. The administration of the harbor and wharf department covers duties peculiar to St. Louis.

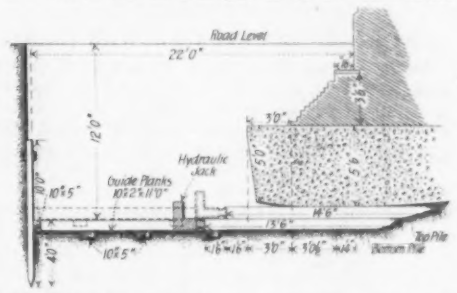
The sections of the new charter relating to street railways contain some points of general interest. The Municipal Assembly has the power to determine all questions arising with reference to street railways within the corporate limits of the city. These questions involve the construction of lines, granting the right of way and regulating and controlling them after completion. The Assembly has the right to sell the franchise or right of way for such railways to the highest bidder, or, as a consideration therefor, to impose a per capita tax on the passengers carried, or an annual tax on the gross receipts, or a tax on each car. No street railway can be incorporated or built, except in accordance with the charter conditions.

The Assembly can regulate the time and manner of running the cars, the rates of fare, the sale and exchange of tickets between the several companies, and it can tax the property of companies, as provided by law. Any street railway unable or indisposed to conduct its business under the requirements of the city charter must surrender its charter and franchises. A uniform gage is established for the street railways, and no flat rails can be used having a less width than 2½ ins. in the part of the flange traveled upon by ordinary vehicles. The street railway companies must keep the streets in perfect repair between the rails, and for 12 ins. outside of each rail. The paving inside the rails must be of the same material as that on the rest of the street, and this paving must be maintained as nearly as practicable on a level with the rails. The railway companies must give bonds for a faithful compliance with these regulations.

Any street railway company has the right to run its cars over the track of any other street railway company, in whole or in part, upon payment of just compensation for this use, under rules fixed by the Assembly.

THE UNDERPINNING OF THE HIGH COURT BUILDING, CALCUTTA, INDIA.

The tower and walls of the Calcutta High Court building began to settle during the construction in 1866-70, says "Indian Engineering," but as this was usual in heavy buildings erected upon the soil of that city, it was expected that the settlement would cease in a few years. This was not the case, however, and in 1892 it was found that the tower had settled 9.42 ins., and was leaning outward 11.66 ins. in a height of 87 ft. The south



Underpinning of High Court Building, Calcutta.

face of the building had also settled 6.47 ins. and was leaning outward an average of 8.25 ins. in a height of 65.25 ft. at the tower, and 4.5 ins. at the extreme ends.

The walls were placed on a brick footing course 3½ ft. deep, and extending at the base 4 ft. 4½ ins. in front of the face of the wall. This foundation rests on a bed of concrete 5½ ft. deep and extending 3 ft. beyond the face of the foundation, or 7 ft. 4½ ins. beyond the face of the wall. The drawings and description do not give the full width of this concrete base.

To arrest the sinking, it was determined to add to the bearing surface by underpinning the concrete with two layers of 10 × 10 in "sal" wood beams, driven in horizontally from the front, one layer over the other. The top beam was 14½ ft. long under the tower foundation, and the bottom beam 13½ ft. long. The points of these beams were shod with wedge-shaped shoes, so arranged as to tend to make the point rise in driving.

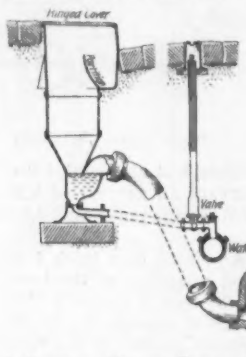
This work of underpinning was executed as follows for the tower: The front of the tower was divided into six sections of about 6½ ft. each in width, and a pit extending 22 ft. from the face of the building was dug down to the level of the bottom of the foundation. This width was limited by the presence of a main sewer in the street. To accurately locate the lowest level of the concrete a 4-in. auger was used, working on a horizontal guide fixed for it. Repeated trials were made with the auger until this was found to just graze the lowest point of the concrete. The pit was then dug 12 ins. below this level to allow for the first pile and the 2-in. guide plank. Piles were driven for a back support for the 20-ton and 50-ton hydraulic jacks, and the latter butted against a cross-piece set against the piles. A guide slide was made by embedding three sleepers in the earth on a horizontal plane, and placing on these a 2-in. plank.

When all was ready the piles, charred and tarred, were lowered into the pit, placed in position and driven in by the 50-ton jacks gradually and evenly under the concrete. This operation was repeated until the first row of piles was driven close together under the whole face of the section excavated, 13 ft. of this row of piles being under the foundation and 1½ ft. projecting on the front. The pit was then dug 10 ins. deeper, and the second row of piles was driven under the first in like manner, with 12 ft. under the foundation and 1½ ft. projecting beyond the face of the first row. This arrangement gave 3 sq. ft. of additional bearing for the tower for each lineal foot of face. After driving the second layer all irregularities on the face, between the piles and the face of the concrete, were filled with brick masonry and cement to obtain all the bearing possible. This operation was repeated section by section until the whole tower was underpinned, a distance of 45 ft. 8 ins. This required five months' time, 98 piles being driven, and the total cost was about $4,250.

Under the 379½ ft. of the south face of the building the piles used were only 10 ft. long and 10 × 5 ins. in section, each layer projecting 12 ins., or 2 ft. in all, beyond the face of the concrete. The additional bearing provided was then 2 sq. ft. for each lineal ft. of wall. In this case 20-ton hydraulic jacks were used, though the general process was the same. The expenditure on this wall was about $9,000. This description is an abstract of the report of Mr. Charles Warde, C. E., Executive Engineer, Calcutta.

A NEW GERMAN STORM SEWER INLET.

An interesting storm sewer inlet, known as the Bindewald-Teinturier, has been put on the market in Germany. The inlet is designed to exclude street dirt from the sewer, and to be easily flushed out. To effect this, the partition shown in the accompanying illustration is placed at the mouth of the inlet, and the base of the inlet proper is connected with the street water main. The siphon trap is provided to cut off any possible gases from the street.



A German Storm Sewer Inlet.

To clean the inlet, the hinged cover is opened and the deposits in the chamber are removed with a scoop. After opening the valve, the water rises in the inlet in a powerful stream, which is thrown back by the cover, gradually filling the entire space up to the gutter level. When the valve is closed the inlet is still further flushed, and also the neighboring part of the sewer. Each cleaning requires about 40 gallons of water, and one man can clean 100 to 200 inlets in a day.

DAM NO. 5 FOR THE ADDITIONAL WATER SUPPLY OF BOSTON.

(With inset.)

The latest dam undertaken by the city of Boston in connection with the extension of its water supply is illustrated on the inset in this issue. We are indebted to Mr. Desmond FitzGerald, M. Am. Soc. C. E., Engineer-in-Charge of the additional supply, under the City Engineer, Mr. Wm. Jackson, M. Am. Soc. C. E., for the following description of the work:

Basin No. 5, on the Stony Brook branch of the Sudbury River, is probably the last basin that will be constructed in the development of the present supply. It is situated for the most part in the town of Southborough. The area of the water surface will be 2 sq. miles, but nearly 2,000 acres of land have been "taken" by the city.

The reservoir is to be deepened and filled in shallow places, according to the Boston plan of treatment for shallow flowage, so as to make about 10 ft. of water all around the margins. The whole bottom will be stripped, and the loam deposited upon the shallow areas and faced with clean gravel with slopes of 3 to 1. The average depth of water in the reservoir will be about 20 ft., but near the dam there is a large area where the water will be about 60 ft. deep.

The dam is now in process of construction. Its length is 1,950 ft. It is composed of two large earth embankments, one on each side of a central masonry overflow, 300 ft. in length. A plan of the dam is shown on the map, Fig. 1, on the inset, and a general elevation by Fig. 2. Two sections of the earth embankment, taken at A B and C D on the general elevation, are shown in Figs. 3 and 4, and a section of the masonry overfall is shown in the upper right-hand corner of Fig. 5.

The overflow is of rather heavier section than usually employed, as the water is to pass over its crest, and it is calculated to take a heavy pressure in its upper portion from the expansion and thrust of ice. The earth embankments will contain concrete walls freed with neat Portland cement plastering upon the water side. It has been found by experiment that where this is properly done the whole head of water is held up at this portion of the embankment.* The water is to be drawn from the reservoir through three 48-in. pipes, as shown in detail by Figs. 5 and 6. This large capacity is provided in order to furnish the whole Metropolitan area with Nashua River water should the present plans of the State be carried out.** It is intended to use Basin 5 as one of the links in the chain connecting the Nashua with Boston.

The cost of the basin has been estimated at about $2,600,000, of which $600,000 represents the probable cost of the dam. It is expected that it will add about 15,000,000 gallons daily to the Boston supply in a severe period of drought.

COFFERDAMS USED AT THE QUEEN'S BRIDGE, MELBOURNE, AUSTRALIA.***

This bridge is a plate girder bridge about 400 ft. long and 100 ft. wide, the girders being under the deck. The girders are continuous over four piers of cylinders, eight to a pier, the ends resting on masonry abutments. A reef of bluestone originally existing at the site of the bridge had been removed by blasting under water to a general depth of 14 to 15 ft. below low water, leaving a very rough rocky bottom, with some loose stone on the bottom, which could not be removed by the spoon dredges employed for the purpose. The river bed had been shattered by the blasting. At the south abutment the reef had not been removed to the general depth, owing to its proximity to the approaches to a temporary bridge. At the north abutment the reef had for part of its length been entirely removed, and here the depth was about 18 ft. below low water. The river had silted up over the whole site to a depth of about 3 ft. of very soft silt. The range of tide was about 3 ft., with exceptional cases of 4 ft. to 4 ft. 6 ins. Cofferdams were necessary for the abutments at least, and were considered best for the piers, as a site had to be cleared of all broken rock, and kept free from silt for each cylinder at least 4 ft. larger in diameter than the cylinders themselves. The expense of putting the ordinary clay puddle cofferdams round four piers, each about 100 ft. long, and in front of each abutment was rather alarming. I therefore proposed making a cofferdam in which the clay would be replaced by a water-tight tarpaulin. This would effect economies in several ways, viz., the expensive item of clay would be replaced by a tarpaulin, which need not be of the very best materials; the outside sheeting would be dispensed with altogether, and the inside sheeting would be of lighter construction, as it would only have to resist the pressure of water instead of puddled clay. The latter must be the greater, seeing how securely the two sides of sheeting in the ordinary clay cofferdam have to be tied together to prevent them spreading under the pressure of the clay before the dam is pumped out. Another advantage of the single sheeting cofferdam over the clay one with double sheeting, is that instead of having the uncertain pressure of puddled clay to provide for, we have the known pressure of water, so that the factor of safety may be comparatively lower. Owing to the exigencies of the work, we had to begin putting in cylinders before anything else. I proposed building a tarpaulin cofferdam, such as I have just described, round the site of one-half a pier at a time, but could not get authority from the contractor for such a large experiment, and had therefore to be contented with a trial one round one cylinder. This was found so successful that all the cylinders were put in in the same fashion, except a few where the reef had been removed, which were sunk from staging by loading with old iron rails.

The dam round each cylinder was made square in plan, with the whole of one side opening outwards as a door, so that after putting in a cylinder, the door could be opened and the dam removed, and used again for another cylinder. The dam was built on shore complete, and launched ready for immediate use on the site of a cylinder. The sheeting was vertical, and consisted of 12 × 4 ins. rough-sawn Oregon planks, supported by horizontal frames of 12 × 12 ins. Oregon timber, spaced close together near the bottom of the river, to carry the greater pressure of water. Up the four corners of the dam were 12 × 12 ins. Oregon pieces, into which the frames were checked, and by which they were kept to their proper spacing, and which formed supports for the door. Outside the sheeting, at the top and bottom frames there were outside walings, 12 × 6 ins. (keeping the sheeting in place), bolted to the frames inside by 1-in. bolts, two to each waling, passing between two pieces of the sheeting. The tarpaulin commenced at the corner on which the door closed, and passed completely round the outside of the dam, being tacked to the outside walings when considered necessary. Before launching the dam, all the sheeting was arranged with the bottom ends flush with the bottom frame, and a chisel mark made in the sheeting at the top frame. It was placed over the site of a cylinder, and loaded until it sank as far as it could be conveniently made to, and the sheeting then driven by a pile driver home to the rock through puddled clay, which had been thrown on the site. The dam was then pumped out with pulsometer pumps, and the cylinder put in as required. The vertical sheeting was then drawn by screw jacks, one plank at a time, until the chisel marks came back to their original position, the door was opened, and the dam removed to another site. The only difficulty experienced with this dam was that caused by the two 1-in. spaces between the sheeting on each side where the bolts passed through to the outside walings. This only occurred below the bottom frame, and it had been hoped that the puddled clay thrown on the site would have been sufficient to close it. The space when plugged with soft wood wedges gave no further trouble. In subsequent dams, this space was reduced to about ⅝ in. by having the 1-in. bolts flattened where they passed through the sheeting. The sheeting swelled over this space and closed it, so that this source of trouble was removed. The tarpaulin become accidentally torn off one of these dams, which was just as tight after as before, showing that the tarpaulin was not necessary, even though the sheeting was rough sawn and not specially selected. Therefore, in erecting the cofferdams for the abutments, no tarpaulin was used.

The river bottom being broken rock, covered with 3 ft. or so of soft silt, it was considered advisable to cover the site of each dam with puddled clay, which it was expected would drop through the soft silt some distance, and to drive the vertical sheeting through it to the rock. Then, as the dam was pumped out, if silt ran in, the clay would take its place. This was found to be the case, so after driving the sheeting, more puddled clay was thrown in, outside the dam in bags, and loose according to the position of leaks, etc. The cofferdams for the abutments were built on shore in sections 30, 40 and 50 ft. long (to suit the section of the river bottom and to use the sizes in the possession of the contractor) with the vertical sheeting of 12 × 4-in. planks in position ready for driving, the length of sheeting having been determined by soundings taken along the line of the future dam. The sheeting was not in any way prepared, being simply in the rough. It was supported inside by horizontal beams, spaced at varying distances to suit the load each should carry, getting closer together as the depth below the surface increased. The upper ones were 12 × 12 ins., the lower ones 14 × 14 ins., and 16 × 16 ins., according to the depth. The sheeting was kept in position by a pair of 12 × 6-in. walings outside, one to the top beam and one to the bottom, fastened to the beams by 1-in. bolts flattened to ⅝ in. where they passed through the sheeting. The horizontal

* We hope to give our readers before long the results of some instructing observations made by Mr. FitzGerald on this subject.

** See Eng. News, March 7, 1895, for description of the proposed Boston Metropolitan Water Supply.

*** Abstract of a paper read before the Victorian Institute of Engineers, at Melbourne, Oct. 3, 1894, by Mr. W. R. Rennick.

beams were supported by verticals 14 × 14 ins., spaced as required, which again were supported by horizontal struts to the shore. The bottom beam was made to conform generally to the slope of the river bottom, as shown by soundings taken from a raft of logs moored exactly over the site of the dam. To fix the site of the dam, and to assist in fixing it when in the water, a line of piles with iron shoes was driven through the puddled clay into the shattered rock. These piles were supported from the shore by struts, and when the dam was secured to them, they acted also as vertical beams to support it. Immediately a section was launched it was placed in position by the pile driver on a punt, iron ballast being attached to the inside of the dam, to assist in making it float vertically. It was loaded and secured to the previous section, and the sheeting driven home. The soft wood, then, in expanding with the water, closed all crevices, and made the sheeting water-tight. Horizontal struts from the shore were attached to the verticles at water level, the struts being floated into position. All the additional struts below low water were put in perfectly horizontal, as the water was pumped out of the dam (with centrifugal pumps), thus saving the expense of divers. Great care was taken that none of these struts sloped upwards towards the dam; but, if anything, sloping downwards, so as to obviate the danger of the dam lifting bodily from the river bottom, as the hold of the piles was necessarily very slight, and the dam itself was, of course, very light in comparison with the pressure of water against it. The water was pumped out slowly, to give time for fixing the horizontal struts to the shore, and also because the water in the dam being clear, any leak could be seen by the discolored water flowing in, and clay could be thrown in outside, either in bags or loose, or else the leak, if small, could be allowed to choke itself by leaves, etc., carried by the water. Divers were used with comparative rarity to place bags of clay in some of the worst places, and to investigate the cause of any serious leak. When the dams were pumped dry, no particular trouble was experienced in keeping them so. The long dams in front of the abutments gave so little trouble, that I am satisfied that a similar dam round each pier of cylinders, as originally planned, would have been much cheaper than a dam round each cylinder individually, and would have saved very much time and labor in setting out the positions of the cylinders.

Before proportioning the timbers to suit the load each should carry, I made a rough experiment to determine the strength of the timber I had to use. As the timber in the cofferdam might remain soaking in water for a considerable time before being strained, I had a piece of the Oregon timber cut into small strips and planed. Then, by a crude experiment on the works, the strength of the timber was determined. Some of the pieces had been kept some weeks soaking in water, while the rest were kept dry. It was found that the soaked pieces were invariably much weaker than the dry ones, the average loss of strength being as much as 33%, and the mode of fracture was very different. The dry pieces cracked and broke little by little as the load increased, giving way ultimately with a long fracture, whereas the soaked pieces snapped suddenly with a very short fracture. The strength found from the soaked pieces was the one adopted, and as the pressure was the known pressure of water, a low factor of safety was adopted.

REMOVING IRON FROM DRINKING WATER.

At Aurich, in East Friesland, a 1½-in. tube well was sunk to a depth of 276 ft. in alluvial ground for supplying water to a soldiers' barracks. The water obtained was free from organic matter, but unfit for use, owing to its containing in solution as much as 19.2 milligrams of iron per liter (about 2.0 parts per 100,000). As described by Mr. H. Schuster, in the "Zeitschrift des Ingenieur und Architekten Vereins zu Hannover," the following plan was adopted for purifying it:

It was determined to break up the mass of water so as to obtain the largest possible contact with the air. To this end a rectangular iron scrubber was erected, 10 ft. high, 6½ ft. long and 3½ ft. wide. This was filled with lumps of coke of the size of a fist, and the well water, pumped by a petroleum engine, was distributed uniformly over the top of the coke bed by a series of perforated iron plates and passed downward into a collecting basin below. From this basin it was sent through a sand filter about 2 ft. deep and having a surface of 118 sq. ft. The proportion of iron was diminished about 63% in the scrubber, and about 93% by the scrubber and filter together. The apparatus was designed to treat 925 gallons per hour.

The ochre deposit was removed from the coke by shutting off at the filter outlet and then pumping water through the coke in a strong current and out by special waste pipes. The filter itself had to be renewed every three or four weeks. The cost was about 12 cts. per 10 working hours, for oil fuel and attendance. Practically the same process, it is reported, is used in supplying the new parts of Berlin, where nearly 24,000,000 gallons daily are thus treated.

STRENGTH OF MATTRESS CONSTRUCTION.

Mattresses have been largely used for many years in the construction of the Holland dykes and for the protection of the coast from erosion. Recent examination of some of this mattress work by divers has shown that the old mattresses have been torn apart in some cases by the weight of the riprap resting on them. The mattresses were 82 × 164 ft. in size, and consisted of a bottom and a top layer of brush bundles, 3 ft. c. to c. and crossing each other at right angles. Around each alternate longitudinal and transverse bundle, galvanized steel wire, 5-32 in. in diameter, is firmly wound spirally with about 5 ins. pitch. The ends of the wire are wound three times around the ends of the bundle and fastened. The upper and lower grillages are connected by wire along the edges of the mattress at each wire-wound bundle, and in two intermediate longitudinal rows at the intersection of such bundles. A pull on the mattress will cause the bundles to stretch, thus ordinarily diminishing their resistance. Compared with the bundles, the wire may be considered as unstretchable. Its lengthening can take place only by a diminution of the diameter of the spiral, thus pinching the bundles and increasing their frictional resistance. Experiments gave the following results: An ordinary brush bundle stretched 3 ins. under a pull of 110 lbs. and tore at 165 lbs., while the elongation of a wire-wound bundle remained proportional up to 725 lbs., being 2⅛ ins. per yd. of length. The cost of a mattress, 17 ins. thick, increases 11% per sq. yd. if the bundles are reinforced in one direction, and 21% when both longitudinal and transverse bundles are wire-wound. The latter construction becomes necessary if the bottom slopes in both directions. Investigations by divers proved the value of the reinforcement, as the mattresses so made were found intact, whereas the ordinary mattresses were more or less torn to pieces.

THE WORLD'S RAILWAYS.

According to the "Railway News," there were 406,416 miles of railway in the world at the end of 1892, or one mile to every 3,516 inhabitants. The railway mileage by principal nations stood as follows: The United States, 174,784 (179,000 at the end of 1894 in round numbers); Germany, 27,455; France, 24,018; United Kingdom, 20,325, and Russia, 19,656 miles. Europe, all together, contains 144,380 miles of railway; North and South America, 218,910 miles, and Asia has only 23,299 miles, of which 17,768 miles are in British India. Australia contains 12,685 miles, and Africa 7,212 miles. Porto Rico has the smallest mileage of any separate state, or 11 miles of railway.

In regard to length of railways per 100 miles of area, Belgium stands first, with 29.6 miles; the United Kingdom follows with 16.7 miles. Then come Holland, 14; Germany, 13.2; Switzerland, 13; France, 11.6; and Denmark with 8.4 miles. Italy has 7.7 miles of line per 100 sq. miles of territory; Austria, 6.8; Spain, 3.4; European Turkey, 1.1; Russia, 1 mile. The United States, in 1892, had 6 miles per above unit of area.

The mileage per 10,000 inhabitants is given as follows: West Australia, 111.8 miles; Queensland, 55.9. But West Australia has only 600 miles of line, while British India, with 17,768 miles of railway, has only 1.1 miles per every 10,000 inhabitants. British North America, on the other hand, with 14,870 miles of railway, has 30.8 miles to every 10,000 people, while the United States had about 37 miles per unit given.

FOLDING BEAM COMPASS.

The accompanying cuts represent a new style of drawing instrument, combining an ordinary compass with a beam compass, an arrangement which will commend itself to draftsmen. The ordinary compass, even when fitted with the lengthening bar, is somewhat inconvenient for large circles, being awkward to handle and keep in true position, while the fitting and adjusting of a beam compass to its stick is also inconvenient, and the stick makes this form of compass difficult to carry about. The new instrument, however (known as the American compass), can be converted readily from a leg compass to a beam compass, and folds together compactly. Fig. 1 shows the instrument in position to be used as an ordinary leg compass, and Fig. 2 shows it opened out as a beam compass. In the former position it can describe circles as small as ⅛-in. diameter, and in the latter position can describe circles as large as 11½ or 23 ins., the compass being made in two sizes. With the smaller size two additional lengthening bars can be added, increasing the diameter to 28 ins.; while the larger size can carry three additional bars, increasing the diameter to 50 ins.

Fig. 1

The parts are made of specially hard-rolled German silver and fine steel, nicely finished and well put together, the joints being sufficiently stiff to hold the bars in the position at which they are set, and having notched nuts, which can be tightened up with a key, if necessary. When folded up the instrument is very compact, and can be easily carried in the pocket, the only unusual projection being the nut of the coupling joint, and when used as a leg compass it is as handy as one of the ordinary pattern. The pin points are steel pins of rather unusual thickness, tapered to a point. The instrument is patented, and is manufactured by Schwenke, Kirk & Co., of 26 Church St., New York city. The price is $6 and $7.50 for the smaller and larger sizes, respectively.

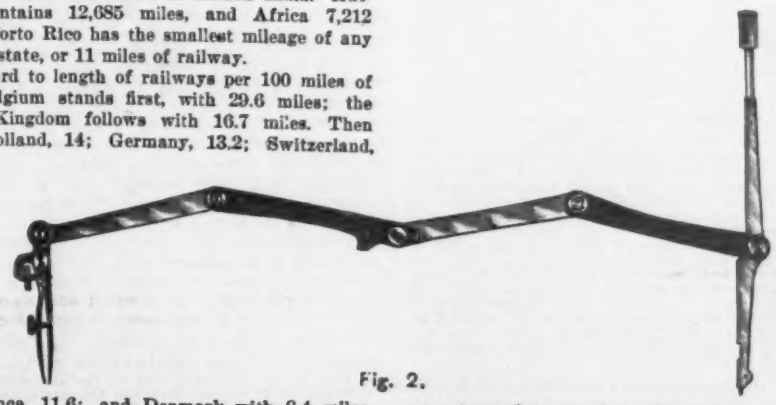


Fig. 2.

COST OF STREET PAVING IN ALTOONA, PA.

We have received from Mr. Harvey Linton, M. Am. Soc. C. E., City Engineer of Altoona, Pa., a table of the amount and cost of all street paving laid in that city during 1888-1894, inclusive. We reprint the following summary, which represents 7.193 miles of a uniform width of 30 ft.:

Material.	Length, miles.	Area, sq. yds.	Cost. Per sq. yd.	Cost. Total.
Sheet asphalt....	3.951	66,133.43	$2.942	$194,563.21
Asphalt block....	2.400	38,129.70	2.7501	104,868.76
Stone block.....	.871	13,542.10	2.9278	39,648.78
Brick	.579	7,212.44	2.1703	15,653.08
Cobble	.126	1,576.30	1.1005	1,734.70
Total and average	7.927	126,593.97	$2.8158	$356,468.53

LEGAL DECISIONS OF INTEREST TO ENGINEERS.

Elements of Damage for Taking Water Rights.

Under the statute providing for the payment of damages by a town taking private land and water rights, where certain water rights belonging to a party were taken and pipes laid on his land, it was proper in estimating the value of the land taken to consider its value as a mill site, not only in connection with the water power which he then possessed, but also with reference to the right which he might acquire under the statute to flood lands on the stream above his own by building a mill.—Fales v. Town of Easthampton (Sup. Jud. Ct. Mass.), 38 N. E. Rep., 1129.

Eminent Domain—Property Must be Paid for Before Taking.

The just compensation required to be made for taking private property for public use, under the laws of eminent domain, must be ascertained before taking, and compensation made for same before entering, whether the appropriation of such property is by a municipal or other corporation.—Livingston v. Board Comrs. Johnson County (Sup. Ct. Neb.), 60 N. W. Rep., 555.

Liability for Bursting of a Sewer.

A contractor is not liable for damages caused by the bursting of a sewer completed by him, under the direction of the city, in a manner claimed to have been negligent, the city having assumed control of same, although it had not been formally accepted by the city.—1st Pres. Cong. v. Smith (Sup. Ct. of Penn.), 30 At. Rep., 279.

A Grant to Water Company Not an Exclusive Franchise.

A legislative grant in general terms to a corporation of a franchise to supply a city with water does not carry with it the exclusive right of so doing.—In re City of Brooklyn (Ct. App., N. Y.), 38 N. E. Rep., 983.

Funds Liable for Payment of Improvement Bond.

A county bond issued for a particular improvement is chargeable only against the fund collected for that improvement, and is not a charge against the general fund of the county.—Walker v. Bd. Comrs. Monroe County (App. Ct. Ind.), 38 N. E. Rep., 1091.

Setting off Special Benefits from Street Improvements.

Special benefits which may be properly set off against damages are such as increase the value of adjacent property, and these benefits are none the less special because an increased value has also been added to many adjacent private properties, other than that to which a particular litigation is pending. Common benefits are such as are enjoyed by the public at large, without reference to ownership of private property adjacent to the public improvement out of which arose the benefits under consideration.—Barr v. City of Omaha (Sup. Ct., Neb.), 60 N. W. Rep., 591.

When Municipal Bonds in Aid of Railway are Void.

Railway aid bonds issued by a municipal corporation in one of the territories are void, under the act of June 8, 1878 (20 St., 101), which provides that nothing therein shall authorize a corporation to incur any debt or obligation except such as shall "be necessary to the administration of its internal affairs."

"Internal affairs" of a municipal corporation, in the administration of which the legislature could alone authorize it to incur a debt, is undoubtedly intended to designate such business as municipalities of like character are usually required to engage in to fulfill their proper functions and to effectuate the objects of their charter. In the case of counties these functions are ordinarily to provide a court house for the administration of justice; a jail for the confinement of prisoners; a poor house for the sustenance of paupers; offices for the various officials of the county; and, under certain circumstances, highways and bridges for the accommodation of the public. It could never have been contemplated that this power would be used to incur obligations in favor of a railway operated by a private corporation for private gain, though also subserving a public purpose. If the issuance of these bonds were a valid exercise of authority, the credit of the county might be indefinitely pledged for the construction of railways extending far beyond the county limits, and, indeed, for carrying out any such schemes of public improvement as they could be persuaded to indorse. Clearly such debts would not be incurred in the administration of internal affairs of the county.—Lewis v. Pima County, Ariz. (Sup. Ct. U. S.), Supr. Ct. Rep., Vol. 15, p. 22.

Validity of Assessments for Construction of Sewer.

The statute under which a local assessment was made upon adjacent property on account of the construction of a sewer, requiring that the notice to be published prior to the final passage of the ordinance should contain a statement of the size of the contemplated sewer, a notice that the sewer would be "of various diameters," with nothing else to indicate its size, was no compliance with the statute, and the ordinance thereafter passed was illegal and void. All that was done under it was without authority of law, and no assessment upon adjacent property on account of the construction of the sewer is collectible. Such ordinance can derive no aid from a proper notice published prior to its introduction, the statute requiring that the notice should be published, not before, but after the ordinance was introduced.—City of Atlanta v. Garbett (Sup. Ct., Ga.), 20 S. E. Rep., 306.

Right of Street Railway in Construction on Street.

The right of way acquired by a steam railway company being subject to the easement of the public in the street, and as the operation of the railway imposes no additional burden on it, a company which has acquired from the city authorities permission to build a street railway so as to cross the tracks of a steam railway where they intersect a street, may construct its road across such tracks without compensation to the steam railway company.—Chicago & C. Terminal Ry. Co. v. Whiting H. & E. C. St. Ry. Co. (Sup. Ct. Ind.), 38 N. E. Rep., 604.

Validity of Assessments for Sprinkling Streets.

A city authorized to levy taxes for local assessments for "sewerage, paving and other like purposes" cannot levy such assessments for sprinkling streets. Pettit v. Duke (Supr. Ct. of Utah), 37 Pac. Rep., 568.

BOOK REVIEWS.

IN THE HEART OF THE BITTER ROOT MOUNTAINS.—The Story of the Carlin Hunting Party, September-December, 1893. By Heclawa. New York and London: G. P. Putnam's Sons. 12mo; cloth; pp. xx., 259; 28 illustrations; $1.50.

The loss and rescue of this party will be remembered by most of our readers. One of the members of this party was an engineer, and designed the rafts on which the party made a large portion of its journey back to civiliation after becoming snowed in and abandoning their horses. Sketches showing details of this raft are included in the volume. A folding colored map of the "Clearwater Basin and Adjoining Territory," on a scale of 15 miles to 1 in., is presented. This map was drawn by the engineer-member of the party (Mr. A. L. A. Himmelwright) from personal notes and such partial maps of the region as were available, and is believed by him to be the most accurate and detailed map of the region in existence.

THEORY OF TURBINES. By De Volson Wood, Professor of Mechanical Engineering, Stevens Institute of Technology. New York: J. Wiley & Sons. 8vo; 70 pp.; $1.

In this work Prof. Wood includes in his analysis the frictional and other resistances within the wheel, neglected by Poncelet in his famous solution of the Fourneyron turbine of 1838. While Weisbach includes this frictional resistance, his formulas are exceedingly complex and practically unavailable for general use. Prof. Wood here seeks to simplify the solution of turbine problems by taking wheels of commercial proportions, and from them deducing certain numerical results, which he enters in tabular form. A simple inspection of these tables supplies considerable desirable information. He discusses water-driven motors alone, or those in which the driving power is considered as an incompressible fluid; steam, being compressible, is not considered in connection with its use in turbines. Reaction, or pressure, turbines of a number of types are analyzed and illustrated by diagrams.

A TREATISE ON PUBLIC HEALTH and Its Applications in England, France, Belgium, Germany, Austria, Sweden and Finland. By Albert Palmberg. Translated from the French Edition and the Section on England Edited by Arthur Newsholme, M. A. Lond., D. P. H. London: Swan Sonnenschein & Co. New York: Macmillan & Co. 8vo; pp. 539; 182 illustrations; $5.

Scattered through this volume are illustrations and brief descriptions of many details of sanitary engineering construction as practiced in the countries named above. The purpose of the author seems to have been to set forth fully the sanitary organization and work of each country, as carried out under government direction, and besides this, to present information in relation to the manner in which sanitary problems have been solved throughout a large part of Europe. At the end of the volume tables are given designed to show the value of public hygiene. Most of our American states have scarcely made a beginning in scientific sanitary work along the many engineering lines which the highest progress must follow. Legislation, organization and all the details of administration yet remain to be inaugurated in some states and to be perfected in others. As an aid to such work, this book will be found helpful and suggestive, while the minor details of sanitary engineering construction already mentioned will be of use to many.

AGRICULTURE BY IRRIGATION in the Western Part of the United States at the Eleventh Census. Department of the Interior, Census Office. F. H. Newell, Special Agent. Washington, D. C.: Pub. Doc. Where a copy cannot be obtained free on application to a Member of Congress, it may be bought from the Department of the Interior for 75 cts. 4to; cloth; pp. 283; 41 maps and diagrams.

While this volume is not published until some four years after the date of the inquiry, it will prove of interest to all who are following the agricultural and irrigation problems of the United States and the many problems closely associated with these. At a time when practically all the naturally cultivable lands of the country have been taken up by settlers, thus setting back the tide which for scores of years has been flowing from overcrowded conditions in the East, the possibilities are becoming clear that large areas of public lands heretofore unavailable through lack of water may be converted into farms and homesteads by means of irrigation. To determine broadly what irrigation had accomplished, and to indicate broadly what it may yet do in the United States as a whole, and in each of the arid and semi-arid states, was the object of one division of the last census. The results of these inquiries have been made public, in part at least, by census bulletins issued from time to time, but the collection of all these reports into one volume, with maps, diagrams and pleasing half-tone reproductions from photographs, will be welcomed by those most deeply interested in the subject. The placing of these volumes on sale will be a great accommodation to many, and is in accordance with the policy advocated for some time by this journal.

A TABLE OF IRREGULAR CROSS-SECTIONS. By S. E. Moore, Memphis, Tenn. C. F. De Garis Printing Co. 8vo.; 31 pp.; $2.50.

This table is intended to diminish the work of and simplify the computations of regular and irregular cross-sections of earthworks, and it has been especially indorsed for its applicability to levee work. It is based upon the average end area method and applies to all calculations admitting of this solution. It is certainly simple, and it is possible to compute the contents from the notes alone, without platting the cross-sections; though it would probably be advisable to do the platting. The table gives directly the contents in cubic yards of a series of regular triangular prisms 50 ft. long, with heights of from 0.1 ft. to 24.9 ft., and bases of from 1 ft. to 60 ft. The entire cross-section is supposed to be subdivided by diagonals drawn through the quadrangles formed by the heights of the cuts or fills and the intermediate distances out from the center. As before mentioned, the contents of these triangular prisms, for 50-ft. lengths, are taken from the table and added together; the prisms lying outside the slopes are taken from the table in like manner, and the sum of these two outside prisms is subtracted from the sum first found, leaving the cubic contents of the first half-length of a 100-ft. station. There is a small margin of error in computing the outside prisms, but it is too small for practical consideration. The table has been revised and checked by Mr. T. G. Dabney, Chief Engineer of the Yazoo-Mississippi Delta Levee District, and this officer says that it has been in satisfactory use in his office for a year, and he indorses it as superior to any other table in use. For simplicity and ease of application, combined with an accuracy well within all reasonable limits, and for the saving of time and excessive labor, we are inclined to second the indorsement of Mr. Dabney.

BOILER TESTS. By Geo. H. Barrus, S. B., M. Am. Soc. M. E., Member Boston Society Civil Engineers. Published by the Author. Boston: Gowan & Co., Agents. 8vo; cloth; pp. 280; illustrated; $5.

This volume contains the results of 137 tests of stationary steam boilers, conducted by the author in the course of his practice as a consulting steam engineer. The boilers tested were all, or nearly all, located in New England, and it is therefore almost needless to say that they were all of the externally-fired type (with the exception of one Galloway and a few vertical boilers), and most of them were horizontal tubular boilers. The list included, however, some examples of plain cylinder boilers, cast iron sectional boilers and water-tube boilers. The results of each test are so condensed as to give just the information most needful to the student of boiler design, and the number of pounds of water evaporated per hour per square foot of water heating surface is given for each boiler, a fact which is noteworthy, as this important factor is so generally omitted by engineers in giving results of tests. The temperature of the escaping gases is also given in each case.

Part I. of the book, occupying 56 pages, is devoted to a general discussion of the results of the tests, including a comparison of the boilers producing saturated steam with those producing superheated steam, a comparison of different kinds of boilers and different kinds of fuels, and an explanation of the general conditions which secure economy. An appendix contains descriptions of a coal calorimeter, and of the universal steam calorimeter invented by the author.

One very interesting feature of the book is the results which are shown of tests of boilers with their design varied in this or that detail, and with various modes of supplying air or feed water, etc. The student of steam engineering, as well as the practising engineer, cannot fail to find this feature of the work of interest and practical value.

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PERSONALS.

Mr. William Albright, Superintendent of Water-Works at Reading, Pa., has resigned.

Mr. S. A. Fletcher, President of the Atlas Engine Co., of Indianapolis, Ind., died March 20.

Mr. Alfred Noble, M. Am. Soc. C. E., has opened an office as consulting engineer at 1364 The Monadnock Block, Chicago, Ill.

Mr. W. P. Pike, Superintendent of the First Division of the Louisville & Nashville R. R., died at Louisville, Ky., March 25, at the age of 43.

Mr. Joseph W. Capron, for many years Chief Engineer of the Boston & Providence R. R., died at Attleboro, Mass., March 13, at the age of 95.

Mr. Walter C. Simmons, of Providence, R. I., has been appointed Commissioner of Dams and Reservoirs for the state, vice the late Mr. Lemuel E. Stone.

Mr. Thomas Harris, formerly Superintendent of Water-Works at Pittsburg, Pa., died March 29. He was born in Wales, and came to this country about 56 years ago.

Mr. Charles E. Lipe, M. Am. Soc. M. E., of Syracuse, N. Y., the inventor of the Lipe milling machine, died March 17, at the age of 44. He graduated from Cornell University in 1873.

Mr. E. M. Humstone, Master Mechanic of the Philadelphia, Reading & New England R. R., has been appointed Assistant Superintendent, with office at Canaan, Conn., vice Mr. H. D. Masters, resigned.

Mr. Walter S. Newhall has been appointed Engineer of Maintenance of Way of the Cleveland & Pittsburg Division of the Pennsylvania Lines West of Pittsburg, vice Mr. W. H. Scriven transferred to the Eastern Division.

Elliott & Stewart, civil engineers, announce that they are now located in the Woolner Building, Peoria, Ill., and will give their attention to drainage, surveys, and general engineering and superintendence of public or private work.

Mr. Edward Potter, formerly Roadmaster of the old Milwaukee & Mississippi R. R., the first railway in Wisconsin, and which is now a part of the Chicago, Milwaukee & St. Paul Ry., died at Waukesha, Wis., March 24, at the gae of 77.

Dr. Frank B. Wynn has been appointed City Sanitarian at Indianapolis, Ind. He will give his entire time to the work, acting as secretary to the Board of Health, and will be at the head of the force of sanitary officers and inspectors.

Mr. W. H. Scriven, Engineer of Maintenance of Way of the Cleveland & Pittsburg Division of the Pennsylvania Lines West of Pittsburg, has been appointed Engineer of Maintenance of Way of the Eastern Division, with office at Allegheny, Pa.

Mr. W. S. Marten, Superintendent of the Owensboro and Nashville Division of the Louisville & Nashville R. R., has been appointed Superintendent of the First Division of the main line, vice the late Mr. W. P. Pike. Mr. Daniel Breck succeeds Mr. Marten.

Mr. Charles J. Foster, M. Am. Soc. M. E., of Chicago, Ill., who was Mechanical Engineer of the Columbian Exposition, has been appointed Chief Mechanical Engineer of the Cotton States & International Exhibition, to be held at Atlanta, Ga., from September to December.

Mr. James Murray, who died recently in London, at the age of 83, was Master Mechanic of the Baltimore & Ohio R. R. about 50 years ago, and in 1845 established the Vulcan Iron Works at Baltimore, Md. He later became interested with Mr. Ross Winans in his submarine boat and other inventions.

Mr. Theodore N. Ely, M. Am. Soc. C. E., Chief of Motive Power of the Pennsylvania R. R., of the class of 1866 of the Rensselaer Polytechnic Institute, delivered a lecture entitled "Some Things Important for a Successful Professional Career," before the students of that institution, at Troy, N. Y., on March 29.

Mr. H. M. Bell, formerly General Superintendent of the Milwaukee & Northern R. R., and later Superintendent of the Lake Superior Division of the Chicago, Milwaukee & St. Paul Ry., has been appointed Superintendent of Construction of the Merrill, Antigo & Eastern Ry. Co., which will build a road from Antigo to Prentice, a distance of about 70 miles.

Mr. W. J. Haylow has been appointed Superintendent of Transportation of the Plant railway system, with headquarters at Savannah, Ga. The Division Superintendents will be Mr. George W. Haines, at Waycross, Ga.; Mr. J. W. Craig, at High Springs, Fla.; Mr. C. O. Parker, at Montgomery, Ala.; Mr. B. R. Swope, at Sanford, Fla., and Mr. C. S. Gadsden, at Charleston, S. C.

Col. Wm. P. Craighill, U. S. Engineer Corps, Past President of the American Society of Civil Engineers, and Lieut.-Commander M. T. Endicott, M. Am. Soc. C. E., Civil Engineer, U. S. Navy, have been appointed by the President as the two officers to represent the army and navy engineers on the government commission which is to make an investigation of the Nicaragua Canal route. The third member, who is to be a civilian, has not yet been appointed. Mr. A. G. Menocal, M. Am. Soc. C. E., Civil Engineer, U. S. Navy, who is consulting engineer to the Nicaragua Canal Co., will accompany the board in an advisory capacity.

Prof. James E. Oliver, Professor of Mathematics at Cornell University, died at Ithaca, N. Y., March 27, after a long illness. He was born in Portland, Me., in 1829, and was graduated from Harvard College in 1849. From 1849 until 1871 he was an assistant in the office of the American Nautical Almanac. He became Assistant Professor of Mathematics at Cornell University in 1871, and full Professor in 1873. Prof. Oliver had a high reputation as a mathematician, and was remarkable for the clearness with which he presented difficult problems to his classes. He published a few mathematical papers and wrote several text-books on higher algebra and trigonometry. He was a member of several scientific societies.

Prof. Harrington, Chief of the Weather Bureau, has been elected President of the Board of Irrigation, constituted by order of the Secretary of Agriculture and Secretary of the Interior to harmonize the work of the several government bureaus now dealing with the subject of irrigation, and to promote efficiency in developing the arid regions of the West. This board consists of Prof. Walcott, Director of the Geological Survey; Prof. Harrington, Chief of the Weather Bureau; F. H. Newell, of the Geological Survey; Charles W. Irish, Chief of the Office of Irrigation Inquiry of the Agricultural Department; Edward A. Bowers, Assistant Commissioner of the General Land Office; Daniel M. Browning, Commissioner of Indian Affairs, and others. The board has elected Prof. Harrington as Chairman, and Prof. Newell as Secretary.

Major John G. D. Knight, U. S. Engineer Corps, has been assigned to duty by Gen. Casey, Chief of Engineers, to relieve Col. G. H. Elliot of the charge of the water supply works of Washington, D. C., except the Delecarlia reservoir. He will be in charge of the Washington aqueduct, increasing the water supply of the city of Washington, and of the disbursement of the funds pertaining to the erection of the fishways at the Great Falls of the Potomac. The assignment also includes the work of raising the height of the dam at Great Falls, strengthening the conduit and testing the tunnel conduit, in accordance with the legislation of the last Congress. Col. Elliot will continue in charge of the Delecarlia receiving reservoir improvement, which he is detailed to complete by special provision of Congress, despite his retirement.

The American representatives at the International Railway Congress in London next June will be the following: H. Walter Webb, Third Vice-President, New York Central & Hudson River R. R.; Henry S. Haines, M. Am. Soc. C. E., Vice-President, Plant system; C. H. Platt, General Superintendent of the New Haven system, New York, New Haven & Hartford R. R.; Theodore N. Ely, M. Am. Soc. C. E., Chief of Motive Power, Pennsylvania R. R.; Carl W. Buchholz, M. Am. Soc. C. E., Chief Engineer, New York, Lake Erie & Western R. R.; J. J. Frey, General Manager, Atchison, Topeka & Santa Fe R. R.; J. T. Harahan, Second Vice-President, Illinois Central R. R.; E. T. D. Myers, M. Am. Soc. C. E., President and General Superintendent, Richmond, Fredericksburg & Potomac R. R., Wm. H. Baldwin, Jr., Third Vice-President, Southern Ry., and W. F. Allen, Secretary of the American Railway Association. The purposes of the congress and a list of the subjects to be considered were given in our issue of July 5, 1894.

ENGINEERING SOCIETIES.

MASTER CAR BUILDERS' ASSOCIATION AND AMERICAN MASTER MECHANICS' ASSOCIATION.—Arrangements have been made by the standing committee of the Supply Men's Association for an ample amount of space for those wishing to make exhibits at Alexandria Bay during the June conventions. Mr. Chas. W. Crossmon, proprietor of the Crossmon House, has donated the use of the Pavilion, a building 15 × 60 ft., with a veranda 9 ft. in width running entirely around it, in addition to which he will, if found necessary, raise a large tent on the lawn. To insure prompt delivery, consignments should be marked Alexandria Bay, N. Y., via Clayton, care of the Crossmon House, where they will be received by a special committee stationed on the ground at least a week in advance of the conventions and transported from and to the wharf free of charge. For space or further information, address W. C. Ford, Secretary, Supply Men's Association, 29 Broadway, New York city.

ENGINEERS' CLUB OF PHILADELPHIA.—At the meeting on March 16, Mr. William H. Dechant described the method used in Reading, Pa., for graphically representing the size of water pipe on the city plans. Capt. C. B. Dahlgren described his experience in mining in Mexico, 25 years ago. A memorial of the late Samuel H. Smedley was also presented by a committee appointed. L. F. Rondinella, Secy.

AMERICAN INSTITUTE OF MINING ENGINEERS.—The 68th meeting was held in Florida in March, a special train from New York carrying a large party to Ocala, where meetings were held and visits were made to the phosphate region. The special train then carried the party to St. Augustine and several points of interest, and then returned to New York by way of Atlanta, Ga. Officers have been elected as follows: President, Joseph D. Weeks, Pittsburg, Pa.; Vice-Presidents, W. B. Kunhardt, James F. Lewis and C. A. Stetefeldt; Managers, Levi Holbrook, A. R. Ledoux and W. R. Webster; Treasurer, T. D. Rand; Secretary, R. W. Raymond.

WISCONSIN POLYTECHNIC SOCIETY.—At the regular meeting on March 26, Mr. Geo. H. Benzenberg gave an informal address describing the long and difficult construction of the intake tunnel for the Milwaukee water-works, which, though not yet out of trouble, is past the line of discouragement. On April 9 Mr. John Geist, of the Wisconsin Bridge & Iron Works, will read a paper on the new type of lift bridges described and illustrated in Engineering News of March 7. W. K. Means, Secy.

COMING TECHNICAL MEETINGS.

FRANKLIN INSTITUTE, PHILADELPHIA.
April 5. "The Camera in the Wake of Flood, Cyclone and Thunderstorm," by W. N. Jennings. Secy., W. H. Wahl.
ENGINEERS' CLUB OF PHILADELPHIA.
April 6. Secy., L. F. Rondinella, 1122 Girard St.
ENGINEERING CLUB OF COLUMBUS, O.
April 6. Secy., David Buell.
ENGINEERS' CLUB OF KANSAS CITY.
April 8. Secy., F. W. Tuttle, Baird Building.
NORTHWESTERN SOCIETY OF ENGINEERS.
April 9. Secy., D. W. McMorris, Burke Building, Seattle, Wash.
CIVIL ENGINEERS' CLUB OF CLEVELAND.
April 9. Secy., F. A. Coburn, Case Library Building.
NORTHWESTERN RAILWAY CLUB.
April 9. Secy., W. D. Crosman, Ryan Hotel, St. Paul.
WISCONSIN POLYTECHNIC SOCIETY.
April 9. Secy., W. K. Means, Loan & Trust Building, Milwaukee.
DENVER SOCIETY OF CIVIL ENGINEERS.
April 9. Secy., H. Breen, 36 Jacobson, Block.
NEW ENGLAND RAILROAD CLUB.
April 10. Secy., F. M. Curtis, P. O. Box 1576, Boston, Mass.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.
April 10. "The Gas Engine and Its Probable Future," by Sidney Armor Reeve. Secy., F. R. Hutton, 12 W. 31st St. N. Y. city.
ENGINEERS AND ARCHITECTS' CLUB OF LOUISVILLE.
April 11. Secy., Jas. K. Zollinger, Norton Building.
ENGINEERING ASSOCIATION OF THE SOUTH.
April 11. Secy., H. D. Ruhm, Nashville, Tenn.
CANADIAN SOCIETY OF CIVIL ENGINEERS.
April 11. Secy., C. H. McLeod, 12 Mansfield St., Montreal.
MONTANA SOCIETY OF CIVIL ENGINEERS.
April 13. Secy., Forrest J. Smith, Denver Block, Helena, Mont.
INDIANAPOLIS ENGINEERING CLUB.
April 13. "Wind Pressure," by Mr. Thomas H. Perry. Secy., C. C. Brown, City Engineer.
ENGINEERS' CLUB OF MINNEAPOLIS.
April 15. Secy., E. Nexson, Kasota Block.
WESTERN RAILWAY CLUB.
April 16. Secy., W. D. Crosman, Club Room 9, Grand Pacific Hotel, Chicago.
COLUMBIAN ENGINEERING SOCIETY.
April 16. Secy., W. F. Hart, University Building, 15th and H Sts. N. W., Washington, D. C.
AMERICAN SOCIETY OF CIVIL ENGINEERS.
April 17. "Bacteria and Other Organisms in Water," by John W. Hill. Secy., C. W. Hunt, 127 E. 23d St., N. Y.
ENGINEERS' CLUB OF ST. LOUIS.
April 17. "Vitrified Brick for Paving," by H. A. Wheeler. Secy., W. H. Bryan, Turner Block.
ASSOCIATION OF ENGINEERS OF VIRGINIA.
April 17. Secy., J. H. Pilcher, Roanoke, Va.
ENGINEERS AND ARCHITECTS' ASSOCIATION OF SOUTHERN CALIFORNIA.
April 17. Secy., F. Van Vleck, Los Angeles, Cal.
BOSTON SOCIETY OF CIVIL ENGINEERS.
April 17. Secy., S. E. Tinkham, City Hall, Rooms 36 Bromfield St.
AMERICAN RAILWAY ASSOCIATION.
April 17. At Planter's Hotel, St. Louis, Mo. Secy., W. F. Allen, 24 Park Place, New York city.

CONSTRUCTION NEWS.

CONDENSED LIST OF CONTRACTS PENDING WITH DATE OF OPENING BIDS.

Bids to be opened.	Work.	Place.	See Eng. News.
Apr. 5.	Pipe sewers, St. Louis, Mo.		Mar. 21
Apr. 5.	Brick sewers, St. Louis, Mo.		Mar. 21
Apr. 5.	Brick paving, Averyville, Ill.		Mar. 21
	Advertised, Eng. News, Mar. 21 and 28.		
Apr. 5.	School buildings (5), St. Louis, Mo.		Mar. 21
Apr. 5.	Water bonds, Forestville, N. Y.		Mar. 21
Apr. 5.	Pumping machinery, Knoxville, Ill.		Mar. 21
	Advertised, Eng. News, Mar. 21 and 28.		
Apr. 5.	Street improvements, Wooster, O.		Mar. 21
Apr. 5.	Dredging, Wilmington, Del.		Mar. 14
	Advertised, Eng. News, Mar. 14 to Apr. 4.		
Apr. 5.	Electric light plant at Milwaukee, Wis.		Feb. 28
Apr. 5.	Heat'g & vent'g app't's, St Louis.		Mar. 7
Apr. 5.	Grading, etc., Washington, D. C.		Mar. 28
	Advertised, Eng. News, Mar. 28.		
Apr. 5.	Electrical conductors, New York.		Mar. 28
Apr. 6.	Paving, Newark, O.		Mar. 21
Apr. 6.	River improvements, Savannah, Ga.		Mar. 21
	Advertised, Eng. News, Mar. 21 and 28.		
Apr. 6.	Sewers, Plattsburg, N. Y.		Mar. 21
Apr. 6.	Jetty, Portland, Ore.		Mar. 21
Apr. 6.	Electric light fixtures, Milwaukee, Wis.		Mar. 21
Apr. 6.	Laying water pipe, Evanston, O.		Mar. 28
Apr. 6.	Suction pipe, League Island navy yard.		Mar. 28
Apr. 6.	Water-works system, Meadville, Pa.		Mar. 28
Apr. 6.	Sewer castings, Cambridge, Mass.		Apr. 4
Apr. 6.	Stone sidewalks, Marion, O.		Apr. 4
Apr. 6.	Asphalt paving, North Braddock, Pa.		Apr. 4
Apr. 6.	Iron mains, Monrovia, Cal.		Apr. 4
Apr. 6.	Roadbed for street ry., Baltimore.		Apr. 4
Apr. 8.	Bridge bonds ($200,000), Portland, Ore.		Mar. 14
Apr. 8.	Jail, Williamson, W. Va.		Mar. 14
Apr. 8.	Dredging, New York, N. Y.		Mar. 21
	Advertised, Eng. News, Mar. 21 to Apr. 4.		
Apr. 8.	Highways (7 miles), Houston, Tex.		Mar. 21
Apr. 8.	Water bonds ($15,000), Coleman, Tex.		Mar. 21
Apr. 8.	Electric lighting, Chatham, N. Y.		Mar. 28
Apr. 8.	Stone paving, Jersey City, N. J.		Mar. 28
Apr. 8.	Brick sewers (1,570 ft.), Lafayette, Ind.		Mar. 28
Apr. 8.	Electrical installation, Pittsburg, Pa.		Mar. 28
Apr. 8.	Sewers, Louisville, Ky.		Mar. 28
Apr. 8.	Sewers, Rochester, N. Y.		Apr. 4
Apr. 8.	Brick sewer, Malden, Mass.		Apr. 4
Apr. 8.	School buildings, Chicago, Ill.		Apr. 4
Apr. 8.	Artesian well, Toledo, O.		Apr. 4
Apr. 8.	Paving, Brooklyn, N. Y.		Apr. 4
Apr. 9.	Water-wks. system, Seneca, Kan.		Mar. 7
	Advertised, Eng. News, Mar. 7.		
Apr. 9.	Sewers, Westfield, N. J.		Mar. 21
	Advertised, Eng. News, Mar. 21 and 28.		
Apr. 9.	Sewers, Indianapolis, Ind.		Mar. 28
Apr. 9.	Bridges, Indianapolis, Ind.		Mar. 28
Apr. 9.	Macadamizing, St. Louis, Mo.		Mar. 28
Apr. 9.	Retaining wall, etc., Milwaukee, Wis.		Apr. 4
Apr. 9.	Sewer, Far Rockaway, N. Y.		Apr. 4
Apr. 9.	Sewer pipe, etc., New Bedford, Mass.		Apr. 4
Apr. 9.	Canal bridge at Fairport, N. Y.		Apr. 4
Apr. 9.	Granite blocks, New Bedford, Mass.		Apr. 4
Apr. 9.	Boiler, Toronto, Ont.		Apr. 4
Apr. 10.	Buildings at Fort Meyer, Va.		Mar. 14
Apr. 10.	Water bonds ($60,000), Westville, N. S.		Mar. 21
Apr. 10.	Water-works system, Celina, O.		Mar. 21
	Advertised, Eng. News, Mar. 21 and 28.		
Apr. 10.	Sewers, Cincinnati, O.		Mar. 21
Apr. 10.	Dam, Nashua, N. H.		Mar. 21
	Advertised, Eng. News, Mar. 21.		
Apr. 10.	Iron gratings, Mansfield, O.		Mar. 21
Apr. 10.	Water-wks. system, Lyndonville, Vt.		Mar. 28
	Advertised, Eng. News, Mar. 28.		
Apr. 10.	School building, Elizabeth, N. J.		Mar. 28
Apr. 10.	Street improvements, Kansas City, Mo.		Apr. 4
Apr. 10.	Dredging, etc., Chicago, Ill.		Apr. 4
Apr. 10.	Asphalt paving, Ottawa, Ont.		Apr. 4
Apr. 10.	Asphalt paving, Brooklyn, N. Y.		Apr. 4
Apr. 10.	Telephone installation, Washington.		Apr. 4
Apr. 11.	Sewers, Peoria, Ill.		Mar. 21
	Advertised, Eng. News, Mar. 21 to Apr. 4.		
Apr. 11.	Composite light vessel, Wash'ton, D. C.		Mar. 21
Apr. 11.	Sewer pipe, etc., West Newton, Mass.		Mar. 28
	Advertised, Eng. News, Mar. 28 and Apr. 4.		
Apr. 11.	Street sweeping machine, Easton, Pa.		Mar. 28
Apr. 11.	Water-wks. system, Maywood, Ill.		Mar. 28
	Advertised, Eng. News, Mar. 28 and Apr. 4.		
Apr. 11.	Cast iron pipe, Brooklyn, N. Y.		Mar. 28
	Advertised, Eng. News, Mar. 28 and Apr. 4.		
Apr. 11.	Union station, St. Joseph, Mo.		Apr. 4
Apr. 11.	Street sprinkling, Winton Place, O.		Apr. 4
Apr. 11.	Grading, Jersey City, N. J.		Apr. 4
Apr. 12.	Breakwater, Davids Island, N. Y. H.		Mar. 21
Apr. 12.	Brick paving, Springfield, O.		Mar. 21
Apr. 12.	Steel bridge (220 ft.), Ogdensburg, N.Y.		Mar. 28
	Advertised, Eng. News, Mar. 28.		
Apr. 12.	Brick jail, King George, Va.		Mar. 28
Apr. 12.	Public building at Salina, Kan.		Mar. 28
Apr. 12.	Chemical engines (2), Boston, Mass.		Apr. 4
Apr. 12.	Lumber at Fort Delaware, Philadelphia.		Apr. 4
	Advertised, Eng. News, Apr. 4.		
Apr. 12.	Asphalt paving, etc., Omaha, Neb.		Apr. 4
Apr. 12.	Culverts, Washington, D. C.		Apr. 4
Apr. 13.	Road improvement bonds, Athens, O.		Mar. 21
Apr. 13.	Electric lighting, Stratford, Ont.		Mar. 28
Apr. 13.	Public bldg. work at St. Paul, Minn.		Apr. 4
Apr. 15.	Sewer bonds South Orange, N. J.		Mar. 14
May 15.	Plans, etc., for bridge, Montreal		Jan. 24
	Advertised, Eng. News, Jan. 24 and 31.		
Apr. 15.	Water-works system, Westville, N. S.		Mar. 21
Apr. 15.	Dams & shore protec., Rock Isl., Ill.		Mar. 21
	Advertised, Eng. News, Mar. 21 to Apr. 11.		
Apr. 15.	Paving dikes, New York, N. Y.		Mar. 21
Apr. 15.	Water power plant, West Troy, N. Y.		Mar. 21
Apr. 15.	Dredging, Portland, Me.		Mar. 21
	Advertised, Eng. News, Mar. 21 to Apr. 11.		
Apr. 15.	Iron towers, Detroit, Mich.		Mar. 28
	Advertised, Eng. News, Mar. 28 and Apr. 4.		
Apr. 15.	Pipe sewers, Waukegan, Ill.		Mar. 28
Apr. 15.	Filling, etc., San Francisco, Cal.		Mar. 28
Apr. 15.	Water-works system, Norman, Okla.		Apr. 4
Apr. 15.	Sewer, Brooklyn, N. Y.		Apr. 4
Apr. 15.	Court-house bonds, St. James, Minn.		Apr. 4
Apr. 15.	Court-house plans, St. James, Minn.		Apr. 4
Apr. 16.	Stone dikes, Cincinnati, O.		Mar. 21
	Advertised, Eng. News, Mar. 21 to Apr. 11.		
Apr. 16.	Viaduct substructure, Cincinnati, O.		Mar. 28
	Advertised, Eng. News, Mar. 28 and Apr. 4.		
Apr. 16.	Viaduct superstructure, Cincinnati, O.		Mar. 28
	Advertised, Eng. News, Mar. 28 and Apr. 4.		
Apr. 16.	Bridges, Auburn, Ind.		Mar. 28
Apr. 16.	Pumping engine, Oil City, Pa.		Apr. 4
Apr. 16.	Sewers, New York, N. Y.		Apr. 4
Apr. 16.	Pipe sewer, Buffalo, N. Y.		Apr. 4
Apr. 16.	Earth dam, Waterbury, Conn.		Apr. 4
	Advertised, Eng. News, Apr. 4.		
Apr. 16.	Brick sewer, Buffalo, N. Y.		Apr. 4
Apr. 16.	Ext'n of college bldgs., Halifax, N. S.		Apr. 4
Apr. 16.	Asphalt paving, New York.		Apr. 4
Apr. 17.	Sewers (27 miles), Champaign, Ill.		Mar. 21
	Advertised, Eng News, Mar. 7 to Apr. 5.		
Apr. 17.	Dredging, Cleveland, O.		Mar. 28
Apr. 17.	Electric light plant, Willoughby, O.		Mar. 28
Apr. 17.	Bridge, Providence, R. I.		Apr. 4
	Advertised, Eng. News, Apr. 4 and 11.		
Apr. 18.	License to cut timber, Toronto, Ont.		Mar. 21
Apr. 18.	Paving, Warren, O.		Mar. 28
Apr. 18.	Stone paving, Cincinnati, O.		Mar. 28
Apr. 18.	Water-works system, Digby, N. S.		Mar. 28
Apr. 18.	Pipe sewers, Williamsport, Pa.		Apr. 4
	Advertised, Eng. News, Apr. 4 and 11.		
Apr. 18.	Dredging, San Francisco, Cal.		Apr. 4
Apr. 18.	Sewer system, Hastings-on-Hudson.		Apr. 4
	Advertised, Eng. News, Apr. 4 and 11.		
Apr. 18.	Temporary court house, Baltimore.		Apr. 4
Apr. 18.	Public bldg. work at Kansas City, Mo.		Apr. 4
Apr. 19.	Water-works system at Ft. Shaw, Mont.		Apr. 4
Apr. 19.	Pine lumber, St. Louis, Mo.		Apr. 4
Apr. 19.	Sewer system, Fort Shaw, Mont.		Apr. 4
Apr. 20.	Bridge bonds ($39,000), Glendive, Mont.		Apr. 4
Apr. 22.	Elec. light bonds ($12,000), Elberton, Ga.		Mar. 28
Apr. 22.	Pumping engine, Homestead, Pa.		Apr. 4
	Advertised Eng. News, Apr. 4.		
Apr. 22.	Water-works supplies, Cincinnati, O.		Apr. 4
Apr. 22.	Bridge, Kenton, O.		Apr. 4
Apr. 22.	Paving, Medina, O.		Apr. 4
Apr. 23.	Hospital bldg. at Ship Island, Miss.		Apr. 4
Apr. 23.	Grading, Helena, Mont.		Apr. 4
Apr. 24.	Buildings, San Marcos, Tex.		Mar. 28
	Advertised, Eng. News, Mar. 28 to Apr. 11.		
Apr. 25.	Water-works, West Troy, N. Y.		Mar. 28
Apr. 25.	Sewers (18 miles), Manchester, Va.		Apr. 4
	Advertised, Eng. News, Apr. 4 and 11.		
Apr. 25.	Sewer materials, Manchester, Va.		Apr. 4
	Advertised, Eng. News, Apr. 4 and 11.		
Apr. 25.	Stone road, Helena, Mont.		Apr. 4
Apr. 25.	60-in. intake conduit, Erie, Pa.		Apr. 4
	Advertised, Eng. News, Apr. 4 and 11.		
Apr. 25.	Bridge, Gainesville, Ga.		Apr. 4
Apr. 26.	Electric lighting, Greensboro, N. C.		Apr. 4
Apr. 30.	Jail, Dawson, Ga.		Mar. 28
Apr. 29.	Paving, Montgomery, Ala.		Apr. 4
Apr. 29.	Dredging, Wilmington, Del.		Apr. 4
Apr. 30.	Keeping Mobile River clear of timber.		Apr. 4
Apr. 30.	Cement, stone, etc., Mobile, Ala.		Apr. 4
	Advertised, Eng. News, Apr. 4 to 25.		
Apr. 30.	Street improv't bonds, Mt. Pleasant, O.		Apr. 4
May 1.	Sewer system, Sudbury, Ont.		Mar. 28
May 1.	Water-works system, Sudbury, Ont.		Mar. 28
May 1.	Buildings, New Orleans, La.		Mar. 28
	Advertised, Eng. News, Mar. 28 to Apr. 18.		
May 1.	Metalwork, New Orleans, La.		Mar. 28
	Advertised, Eng. News, Mar. 28 to Apr. 18.		
May 1.	Water bonds ($10,000), Cascade, Ia.		Apr. 4
May 1.	Stone and asphalt paving, Cleveland.		Apr. 4
May 4.	Roads (7½ miles), Vevay, Ind.		Apr. 4
May 15.	Smokeless powder, Washington, D. C.		Apr. 4
May 15.	Bridge, Glendive, Mont.		Apr. 4
May 20.	Water bonds, Santa Clara, Cal.		Mar. 7
	Advertised, Eng. News, Mar. 7 to 28.		
May 20.	Court-house, Wrightsville, Ga.		Apr. 4
May 23.	Water-wks. system, Santa Clara, Cal.		Mar. 7
	Advertised, Eng. News, Mar. 7 to 28.		
No date.	Electric light plant, Cascade, Ia.		Apr. 4

RAILWAYS.

East of Chicago.

ATLANTIC CITY.—It is reported that surveys are being made for an extension of the Brigantine Beach road from Pomona to Egg Harbor City, N. J., a distance of five miles. This is a part of the Philadelphia & Reading system.

BAIE DES CHALEURS.—N. K. and M. Connolley are reported to have received the contract for the construction of the extension of this road from near Caplin to Pasbebrac, Que., 20 miles, including a large bridge over the Bonaventure River.

BATAVIA & NORTHERN.—The state board of railroad commissioners is reported to have granted this company and the International & Oak Orchard Harbor the right to build their line from Batavia, N. Y., to Oak Orchard Harbor, on Lake Ontario. Surveys for the road were commenced last week. The American & Canadian Navigation Co. has been incorporated at Trenton, N. J., for the purpose of operating two freight and passenger ferries between Oak Orchard Harbor and Port Hope and Coburg, Ont. Ernest W. Emmons, of Syracuse, N. Y., is general manager and chief engineer of the railway company.

BAY TERMINAL.— Incorporated in Ohio March 20 to build and operate a railway between Presque Isle, Lucas county, and the place where the Lake Shore & Michigan Southern crosses the boundary line of the city of Toledo; capital stock, $20,000; principal place of business, Toledo, O.; incorporators, J. N. Pew, E. O. Emerson, Robt. C. Pew, J. C. McKisson and Samuel M. Glenn.

COUDERSPORT & PORT ALLEGHENY.—Contracts will be awarded about April 10 for constructing this railway, connecting Colesburg, Raymond, Gold and Newfield, Pa. The line will be 23 miles in length. Surveys have been completed, and capital secured for the construction. Pres., Jas. L. Knox; Ch. Engr., Thos. J. Rogers, both of Coudersport, Pa.

EPWORTH LEAGUE.—The incorporation of this company was noted recently under Street and Electric Railways. Geo. N. Stray writes us that it will be a steam road, 4½ miles in length, extending from Ludington, Mich., to Hamilton Lake, via Epworth League grounds. The surveys have been completed, right of way secured and contracts for ties awarded. Pres., Frank Filer; Ch. Engr., John Joyce, all of Ludington, Mich.

FLINT & PERE MARQUETTE.—Wm. B. Sears, Ch. Engr., Saginaw E. S., Mich., writes us that no new lines are in contemplation just now. The financial depression stopped all new projects except a few short spurs for logging purposes.

INDIANAPOLIS, DECATUR & WESTERN.—Press reports state that R. B. F. Pierce, Gen. Man., Indianapolis, Ind., has been authorized to purchase 500 tons of steel rails and two new heavy freight engines.

LIMA NORTHERN.—Incorporated in Ohio March 27 to build a standard gage railway between Lima, O., and the western line of the state, in Williams county, a distance of about 15 miles; capital stock, $300,000; incorporators, A. A. Parman, J. B. White, Jr., B. W. Fenton, Emery Lattemer, and Ralph G. Spencer; principal office, at Lima, O. It is stated that the company will attempt to lease the unfinished Columbus, Lima & Milwaukee, upon which no work has been done for several years. The construction will be commenced as soon as possible.

OTTAWA, ARNPRIOR & PARRY SOUND.—It is reported that the contract for the construction of 30 miles of this railway west of Long Lake, Ont., has been awarded to Poulon & Fitzpatrick; also that contracts have been awarded to Fauquier, Oniel & Ferguson for two ten-mile sections. The construction will be resumed in May.

PLYMOUTH COUNTY.—This railway has been projected for several years from East Weymouth, through Hingham, Hanover, Norwell and Marshfield, a distance of 25 miles. The line has been recently surveyed by E. Worthington, Jr., Boston, and it is stated that the contract for building the road has been awarded to John Leavett, 213 Huntington Ave., Boston. John F. Simmons, Equitable Bldg., Boston, is president, and the chief projector of the road.

PORTLAND & ALEXANDRIA.—Clinton P. Cole, of Dunkirk, Ind., is interested in a railway that is projected from Portland to Alexandria, Ind., a distance of 40 miles, according to reports.

NEW YORK CENTRAL & HUDSON RIVER.—The contract for this company's share of the substructural work to be done in the abolition of grade crossings at Buffalo, N. Y., has been awarded to Dwyer & Huntington, of Buffalo, at about $80,000.

Southern.

CHESAPEAKE, OHIO & SOUTHWESTERN.—E. H. Bowser, Louisville, Ky., writes us that the recent survey from Culvert City to Mayfield, Ky., was for the purpose of finding out how much the road could be shortened. This short cut will probably not be built this year. Ch. Engr., A. T. Sabin, Louisville, Ky.

CHESTATEE PYRITES CO.—George J. Baldwin, Pres., Savannah, Ga., writes us that this company is arranging to build a railway from Lula or Gainesville to Dahlonega, Ga., a distance of 30 miles, passing through the company's mines en route. The construction has not yet been commenced.

HENDERSONVILLE & BREVARD.—This railway has been referred to several times. The "Railroad Gazette" states as follows: Warren, Jencks & McNeely, who are now building this railway in western North Carolina, will have the road completed in May. The road starts from Hendersonville, N. C., 17 miles south of Asheville on the Asheville & Spartanburg, and extends west via Bowman's Bluff to Brevard, 22 miles, through the French Broad Valley. The road goes through a rich farming country, and reaches a hard wood lumber district. Construction is being pushed vigorously, night forces working on the grading, and the road is to be completed in 50 working days. Although in the heart of the mountains, the work is very light, and the grades and curvatures are at the minimum. There will be two steel bridges, one 100 ft. in length, furnished by the King Bridge Co., Cleveland, O., and one 60 ft. in length, furnished by the Union Bridge Wks., Athens, Pa. The subcontractors are T. S. Pruden, Gulf, N. C., for the grading; W. J. Neely, Clay Hill, S. C., cross-ties; J. A. McGuire, Brevard, N. C., trestling, and T. S. Boswell, Brevard, N. C., masonry. About $70,000 in local aid has been voted to the company, $60,000 in county bonds being voted by Transylvania county and the balance by Hendersonville township. The capital stock of the company has been placed at $250,000, and 6% general mortgage bonds amounting to $150,000 have been authorized. Pres., A. E. Boardman, of Brevard, N. C.; Ch. Engr., J. R. Brooks. The headquarters of the company are at Hendersonville, N. C.

JACKSONVILLE, ST. AUGUSTINE & INDIAN RIVER.—Press reports from Palm Beach, Fla., state that H. M. Flagler has accepted the final survey for a railway from West Palm Beach, the present terminus of this road, to Miami on Biscayne Bay, a distance of 65 miles, and that the construction will be commenced at once, and that the road will be built as far as New River, about half-way, in time for use early next winter. Mr. Flagler has purchased one-half of Key Largo, at the foot of Biscayne Bay. This purchase has revived the report that Mr. Flagler intends to build a railway from Miami to Key West city, a distance of over 100 miles. Surveys for such a road were made several years ago, and it is stated that the project was pronounced feasible. The work would require a large number of trestles and bridges.

LIVE OAK & GULF.—J. R. White, Secy., Citra, Fla., writes us that this railway is completed to within 1½ miles of Luraville, and will be completed to the Suwannee River within a few weeks. The extension from that place to Dead Man's Bay has not yet been provided for. The total length from Live Oak, Fla., to Dead Man's Bay, on the Gulf, is 85 miles. The work is being done by the company. Pres., R. L. Anderson; Vice-Pres., Charles W. White, both of Citra, Fla.

MACON, DUBLIN & SAVANNAH.—Press reports state that this company has purchased the unfinished Macon & Atlantic line, and will complete it to Savannah, Ga.

MONTGOMERY & PRATTVILLE.—Incorporated in Alabama March 29 to build a railway from Coosada Station, on the Louisville & Nashville, to Prattville; incorporators, Daniel Pratt, W. J. Northington, of Prattville; Milton H. Smith, W. W. Thompson, H. W. Bruce, J. H. Ringold and R. H. Ingram, of Louisville, Ky. It is stated that the surveys for this road were made by the Louisville & Nashville.

GUYANDOTTE & ATLANTIC.—Incorporated in West Virginia March 29 to build a railway from a point on the Ohio River in Wayne county to a point in Mercer county, W. Va.; capital stock, $50,000; principal office at Charleston, W. Va.; incorporators, F. M. Pierce and E. A. Merrill, of New York; J. D. Miller, J. E. McIntire and F. R. Magee, of Brookiyn, N. Y.

SUWANNEE RIVER.—Incorporated in Florida March 22 to build a railway to Rucki Junction, on the Florida Central & Peninsular, to Jasper, Luraville and Archer, a total projected length of 243 miles, of which

It is stated that 37 miles are now in operation; capital stock, $1,000,000; Pres., E. J. Carter, 40 Wall St., New York; Vice-Pres., W. R. Busenbark, 1 West 81st St., New York; Secy., Frederick L. Watson. Charles A. Baldwin, 9 West 81st St., New York, is one of the directors.

WINSTON & SOUTH BOUND.—A bill has been introduced in the North Carolina legislature to incorporate this company. The road is projected as a continuation of the Roanoke & Southern, which is now operated by the Norfolk & Western. The new road will be 145 miles long, extending from Winston to Monroe, N. C., thence to Ridgeway, S. C., where it will connect with a short line already in operation to Columbia. At Columbia a connection will be made with the South Bound road to Savannah, and thence by way of the Florida Central & Peninsular to Florida. It is claimed that this new line will afford a shorter route to Florida from northern and eastern cities than any existing route.

Northwest.

BRAINERD & NORTHERN MINNESOTA.—It is stated that this road has now crossed Leech Lake in its extension northward. The present headquarters are at Lothrop, 52 miles north of Brainerd. From this place the line is projected to the west to reach a large body of timber, 70,000,000 ft. of which it is expected to take out the coming season.

DULUTH & IRON RANGE.—R. Angst, Ch. Engr., Duluth, Minn., writes us that a line has been definitely located from Stewart River Branch through Two Harbors to Cloquet River, 23 miles, but that no right of way has been secured or contract yet awarded.

MANITOWOC TERMINAL.—Surveys are being made for this railway at Manitowoc, Wis. The company is reported as having already invested upwards of $100,000 in dock property and as projecting a line of boats to Buffalo.

MERRILL, ANTIGO & EASTERN.—It is reported that the construction of this road between Antigo Prentice and Merrill, Wis., about 70 miles, will soon be commenced. About $250,000 in aid has been voted to the company, and H. M. Bell, formerly general superintendent of the Milwaukee & Northern road, and later superintendent of the Lake Superior division of the Chicago, Milwaukee & St. Paul, has been appointed superintendent of construction of the new road.

MISSISSIPPI, COLESBURG & MANCHESTER.—W. C. Kirchheck, Secy., writes us that this company has been organized at Colesburg, Ia., as noted in our issue of Feb. 21, to build a railway from Turkey River Junction to Colesburg and Oneida, a distance of 25 miles. The survey will be made as soon as possible in the spring, and the right of way purchased. No contracts will be awarded until all the capital for the construction has been secured. Pres., E. C. McNamee.

WISCONSIN CENTRAL.—Press reports state that this company will soon build a line from Neenah to Manitowoc, Wis.

Southwest.

DALLAS BELT LINE.—This company proposes to build a belt line about seven miles in length, construction to be commenced in July. No contracts have yet been awarded. Secy., W. A. Calhoun, St. Louis, Mo.; Vice-Pres., F. M. Cockrell, Dallas, Tex.; Pres. and Ch. Engr., G. Howard Ellers, Chicago.

GALVESTON & WESTERN.—This narrow gage railway is reported to have been purchased by the Galveston, Laporte & Houston, and about to be changed to broad gage.

HAMBURG & SOUTHERN.—Incorporated in Arkansas March 28 to build a railway from Hamburg, Ark., southeast to the state line, about 15 miles; capital stock, $140,000; directors, W. F. McCombs, P. A. Jackson, J. H. Pryor, J. B. Pugh and W. W. Whellow, all of Hamburg, Ark.

MISSOURI, KANSAS & TEXAS.—Efforts are being made to secure an extension of this road from Smithville to Gonzales, Tex.

PINE BLUFF & EASTERN.—T. H. Leslie, Gillett, Ark., wants bids for a 12-mile extension of this road from its present terminus to a junction with the Stuttgart & Arkansas R. R.; bids to be made on 3, 6 and 9 months' time, with $100,000 in bonds as collateral. The route is said to be through a level country.

ST. LOUIS, POMONA & FORT SMITH.—A press report from Fort Smith, Ark., states that President McCabe of this company addressed the chamber of commerce of that city March 26 on a proposed extension of the road to that city and on to El Paso, Tex. The route as surveyed shortens the distance between Fort Smith and St. Louis about 145 miles.

TEXAS WESTERN.—There is talk of widening the gage of this road and extending it to Hempstead from Pattison. Gen. Man., E. A. Campbell, Houston, Tex.

Rocky Mt. and Pacific.

CANADIAN PACIFIC.—Press reports state that Foley Bros. & Guthrie, of St. Paul, Minn, have been awarded the contract for extending the Kaslo & Slocan road from Kaslo, on Kootenay Lake, to the mouth of Sandon, on the south branch of Carpenter Creek, three miles above Three Forks.

FLORENCE BELT LINE.—We are informed that a franchise has been secured, and contracts for the construction of this road will be awarded as soon as the bonds have been floated. The line is projected to connect Florence, Coal Creek, Rockvale and Williamsburg, and will also reach Soda Springs, the total length being 7 miles. Pres., E. M. Weil, Florence, Colo.

SAN FRANCISCO & SAN JOAQUIN VALLEY.—W. B. Storey, Jr., Ch. Engr., 321 Market St., San Francisco, writes us that the contract for 10,000 tons of steel rails for this road was awarded to John F. Merrill, of San Francisco, who, it is understood, placed the order with the Lackawanna Iron & Steel Works, Scranton, Pa. No contracts for the construction have yet been awarded. Press reports from San Francisco state that the following contracts were awarded March 20: Holbrook, Merrill & Stetson, for rails and plates; Miller, Sloss & Scott, for spikes, and the Dunham, Carrigan-Hayden Co. for bolts and nuts. The gross amount of the awards is not far from $850,000. The contracts call for 10,000 tons of steel rails; 720,000 lbs. of spikes; 57,000 angle plates, and 150,000 track bolts.

Foreign.

MEXICO.—Press reports from Boroteran, Mex., state that it is announced officially that the federal government has approved the concession granted to a syndicate of American capitalists, of which George Pullman is a prominent stockholder, for the construction of a railway from the coal fields of this place to Nueva Laredo and thence along the Rio Grande border to Matamoras and from there down the gulf coast to the coast of Tampico. This road will traverse one of the richest agricultural sections in Mexico and will develop the extensive coal fields at this place. The proposed road is subsidized by the federal government for a distance of 350 kilometers. The contract for the construction of the line will be let immediately.

GREAT COLOMBIAN.—The Great Colombian Railway Co. was incorporated in West Virginia March 21 to construct and operate a railway between the Magdalena River and the city of Bogota in the republic of Colombia, South America; capital stock, $6,000,000, commencing with $500; principal office, New York city; incorporators, Alfred N. Shandler, E. D. and E. E. Smith, A. S. Chandler, and J. H. Noblit, all of Philadelphia, Pa.

STREET AND ELECTRIC RAILWAYS.

LEWISTON, ME.—Press reports state that a company has been organized to build an electric railway from the East Auburn terminus of the Lewiston & Auburn road to Turner village, a distance of eight miles. The incorporators are: Wallace H. White, William T. Smart, A. B. Isaacson, O. S. Ham, F. W. Dana, N. Q. Pope and Henry W. True. The road will carry passengers, freight and probably the mails.

THOMASTON, ME.—N. C. Mehan writes us that the Rockland, Camden & Thomaston Electric R. R. Co. has been granted permission to extend its road to Warren, but it is doubtful if the road will be built this year.

BRATTLEBORO, VT.—It is reported that $15,000 has been subscribed toward the construction of the Brattleboro St. Ry. Co.'s electric road, estimated to cost about $30,000. As soon as the full amount is subscribed work will be begun. Pres., E. C. Crosby; Vice-Pres., E. L. Waterman; Treas., C. F. Thompson.

NORWALK, CONN.—It is reported that the New York, New Haven & Hartford R. R. Co. has purchased the plant of the Stamford St. Ry. Co. It is probable that the road will at once be equipped with electricity, and that a power plant will be established in Glenbrook, which will also furnish power to the New Canaan and Stamford branch of the Consolidated road.

ALBANY, N. Y.—Plans are being prepared for an electric railway from Albany to Schoharie, a distance of 31 miles, estimated to cost $5,000 to $6,000 per mile. John W. McNamara, Gen. Man. Albany Ry. Co., is interested.

BLASDELL, N. Y.—The Hamburg Ry. Co. has been organized to build a street railway from Blasdell to Woodlawn Beach; capital stock, $10,000; directors, James E. Curtiss, Rollin L. Banta, Lafayette L. Long, Frank D. Caldwell and W. Allen.

BREWSTER, N. Y.—It is proposed to construct an electric railway from Peekskill to this place, by way of Shrub Oak, Mahopac Falls, Carmel and Tilly Foster. Stephen D. Horton, of Peekskill, and Geo. M. Bailey, Secy. Peekskill State Camp & Mohegan R. R. Co., are interested.

BROOKLYN, N. Y.—The Coney Island & Brooklyn R. R. Co. has been granted permission to extend its road on High St., from Jay to Washington St., Brooklyn.

BUFFALO, N. Y.—Press reports state that the contract for the construction of the entire Buffalo and Niagara Falls electric road was let several weeks ago to the White-Crosby Co., of New York. The contracts for materials have been let within the last week. E. Terrill will furnish 80,000 cu. yds. of crushed stone for the roadbed, and Wheeler & Holden, of Buffalo, have contracted to furnish white oak ties. A final survey of the route has been begun, the work of construction will be begun immediately, and the entire road is to be completed and in operation by July.

COHOES, N. Y.—The Cohoes City Ry. Co. will begin at once the construction of its power house. The contract for constructing an extension of the road has been awarded to White, Cullan & Co., of Brooklyn.

CORNING, N. Y.—Arrangements are being made for the immediate construction of the proposed electric railway. A. C. Pond, of Boston, Mass., and Israel C. Kelsey, of New Haven, Conn., are interested.

GENEVA, N. Y.—S. G. Gano, Ch. Engr. Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Co., writes us that the survey will be started at once for the projected electric road from Seneca Falls to Cayuga Lake, a distance of four miles. The capital has been secured and contracts will be awarded as soon as the surveys have been completed. Pres., Thomas Craig, Trenton, N. J.

LOCKPORT, N. Y.—C. A. Johnson, of New York, has been granted a franchise for an electric railway, one mile of which must be constructed in 45 days, and the entire line to be in operation by September.

NEW YORK, N. Y.—The Metropolitan Traction Co. has decided to extend its cable road on 23d St. to connect with the Sixth Ave. horse car lines.——It is reported that the company is about to renew its efforts to secure permission to build a cable road on Fifth Ave. below 23d St.——Plans are being prepared to extend the cable road on College Place, Fulton, Dey and Church Sts. to Battery Place,

ROCHESTER, N. Y.—The Rochester Ry. Co. has petitioned for permission to extend its electric road on several streets. Ch. Engr., G. W. Howard.

NEWARK, N. J.—The Passaic & Newark Electric Ry. Co. has petitioned the road committee for permission to extend its railway.

PLAINFIELD, N. J.—The Plainfield St. Ry. Co. has petitioned for permission to extend its electric line about five miles.

RED BANK, N. J.—S. S. Whitmore and A. B. Eldridge, of Brooklyn; M. H. Hazzard and Benjamin Frick, of New York; Robert Lightfoot, of Jersey City, and W. R. Williams, of Newark, are reported as interested in a projected electric railway between this place and Long Branch, estimated to cost $300,000.

CHESTER, PA.—The Prospect St. Ry. Co. has been incorporated to build an electric railway from Prospect through Tinicum township, Delaware county; capital stock, $50,000, with $15,000 paid in; Pres., Crosby M. Black.

LANGHORNE, PA.—The Newtown, Langhorne & Bristol Trolley St. Ry. Co. has been incorporated with a capital stock of $100,000; Pres. and Treas., Henry W. Watson, Langhorne.

McKEESPORT, PA.—I. L. Derenny, Ch. Engr. McKeesport, Duquesne & Wilmerding Ry. Co., New York, N. Y., writes us that bids will be asked in a few days for the construction of six miles of electric road in this city. Pres., E. C. Converse, of McKeesport.

MINERSVILLE, PA.—Surveys have been made for an electric railway from this place through the Heckshersville Valley and to Forestville, work on which will begin at once, according to reports.

PHILADELPHIA, PA.—The Berwyn & Devon Passenger Ry. Co. has been incorporated to build an electric railway between Berwyn and Devon, a distance of three miles; capital stock, $18,000; Pres., George Roney, 1925 Seventh St.

ROSEMONT, PA.—Press reports state that the Pennsylvania Traction Co., which has a network of lines surveyed through this section, promises to have cars running between Rosemont and Philadelphia before July 1. J. J. Patterson and his son, S. M. Patterson, are now at Bryn Mawr looking into the matter, and have secured nearly all the needed rights of way. Work is to be commenced as soon as the weather becomes favorable, and pushed steadily forward. The company has an agreement with the Philadelphia Traction Co. for transferring passengers in Philadelphia.

SOUDERTON, PA.—C. D. Hunsberger writes us that an electric railway will probably be built from Dublin to Norristown, by way of about 12 villages, a distance of 25 miles. The people are in favor of the road if the company will agree to carry passengers, freight and the mails.

BALTIMORE, MD.—Bids are asked until April 6 for the graduation and other work necessary to complete the roadbed for that portion of the Sparrow's Point extension of the City & Suburban Ry. Co.'s system from the eastern end of the Colgate Creek Bridge to a point beyond Dundalk Station, on the Sparrow's Point R. R., a total distance of about 3,000 ft. City & Suburban Ry. Co., 512 Equitable Bldg.

BOONSBORO, MD.—A. W. Laskin, Pres. South Mountain Electric Ry. Co., writes us that bids may soon be asked for the construction of the electric road between this place and Keedysville, a distance of three miles. Money for the construction is now being subscribed.

NORFOLK, VA.—J. P. Andre Mottu, Pres. South Norfolk Electric R. R. Co., writes us that the company has just been organized, and nothing but preliminary steps have been taken towards the construction of the road between South Norfolk, Berkley and Norfolk, a distance of five miles.

PORTSMOUTH, VA.—The Portsmouth St. Ry. has been sold to John Finney, Secy. Pottsville & Reading Ry. Co., of Pottsville, Pa., and J. K. Sigfried, of Pottsville, for $64,000. The road will be equipped with electricity, and will be extended over a radius of 15 miles, according to reports, taking in Port Norfolk and West Norfolk. It is stated that the improvements, including power house, cars, extensions, etc., will cost about $300,000.

CHARLESTON, W. VA.—Geo. S. Laidley, Secy. West Charleston St. Ry. Co., writes us that nothing beyond organization has yet been done towards the construction of its road, which will be four miles in length. Pres., P. Silmar.

TAMPA, FLA.—It is reported that the Consumers' Electric Light & St. Ry. Co. is receiving bids for turbine wheels, to increase the power generated at its dam from 500 to 700 HP. The company is about to extend its West Tampa branch to Ybor City. Other extensions are also under consideration. Supt., J. C. Douglass.

MEMPHIS, TENN.—John R. Godwin, E. S. Proudfit and J. W. Allison have petitioned the council for a franchise for an electric railway.

BIRMINGHAM, O.—F. Busk, Secy. Milan, Birmingham & Elyria Electric Ry. Co., writes us that the subscription books will be opened April 23 for a road from Milan to Elyria, a distance of 28 miles. Pres., H. D. Olds.

CINCINNATI, O.—The construction of the Cincinnati, Hamilton, Middletown & Dayton St. Ry. Co.'s proposed electric road between this city and Dayton will probably be commenced within a few weeks. Pres., L. C. Weir, Pres. Adams Express Co., New York; S. M. Felton, Pres. Cincinnati Southern R. R. Co.; A. Hickenlooper, Pres. Cincinnati Gas Light & Coke Co., and Geo. B. Cox, Pres. Hauss Bros. Mfg. Co., are interested.——The Harrison Pike Co., Supt., P .Hess, Allen Bldg., has been granted a 50-year franchise for an electric railway over the turnpike from this city to Harrison, by way of Westwood, Dent and Miamitown.

YOUNGSTOWN, O.—The Youngstown St. Ry. Co. is considering the question of extending its electric road to the Ohio Steel Works, at Steelton. Man., A. A. Anderson.

LAPORTE, IND.—It is reported that H. B. Tuthill and A. G. Tillotson have secured a franchise for an electric road between this place and Michigan City, estimated to cost $100,000.

VALPARAISO, IND.—Press reports state that the Hobart Electric Ry. Co. has been organized to build a road from this city to Chicago. Several thousand dollars have been subscribed to aid in the construction. Pres., A. Morrison; Secy., A. J. Smith.

PORT HURON, MICH.—Edgar H. Brennan, of Toledo, O., has petitioned for a franchise for an electric road between this city and Lexington.

BLOOMINGTON, ILL.—The Bloomington Traction Ry. & Electric Co. has been incorporated, with a capital stock of $75,000, by Geo. W. Funk, Henry Capen and James A. Wilson.

CHICAGO, ILL.—The Interocean Electric Ry. Co. has been incorporated to build an electric elevated railway from this city to New York; capital stock, $200,000,000. John W. Hill, Parker Crittenden and James G. Hulse are among the incorporators.

VENICE, ILL.—The Venice, Madison & Granite City Ry. Co. has been incorporated; capital stock, $60,000; incorporators, C. H. Sharman, Fred. E. Allen and E. J. Spencer.

OSCEOLA, WIS.—The Manistee Transit Co. has been incorporated, with a capital stock of $50,000, by Henry B. Dike, C. H. Oakley and H. E. Cornbacher.

WAUKESHA, WIS.—The Waukesha Electric Branch R. R. Co. has petitioned for a franchise.

FORT MADISON, IA.—The Fort Madison St. Ry. Co. has been granted a franchise for its electric road. J. C. Hubinger & Co., of Keokuk, are interested.

ST. PAUL, MINN.—The Twin City Rapid Transit Co. is considering the question of changing its Selby Ave. cable road into an electric railway. The work may be commenced between May 15 and June 1. Supt., B. W. Martindale.

OMAHA, NEB.—It is reported that steps have been taken for the construction of an electric railway between this city and Fremont, a distance of 30 miles, and estimated to cost $125,390. J. H. Pratt, of Bennington; F. H. Hibbard, of Irvington; D. W. Cannon, of Elk City; G. W. Cooper, of Omaha, and J. F. Hansen, of Fremont, are interested.

CARTHAGE, MO.—H. H. Harding, Pres. Joplin & Galena Electric Ry. Co., writes us that this company was organized to acquire an electric railway already built and in operation in Joplin. It may be later extended from Joplin to Galena, a distance of eight miles, although nothing is being done at present towards the extension.

LODI, CAL.—E. A. Bunn, of Peoria, Ill., has petitioned for a franchise for an electric road from Stockton to this place.

OAKLAND, CAL.—The Consolidated Piedmont Cable Co. has changed its name to the Piedmont & Mountain View Ry. Co.; capital stock, $1,000,000, with $15,000 paid in. It is proposed to build an electric road over the hills to Piedmont, to take the place of the cable road. Several other improvements, including the purchase of new cars, will be made. Pres., Charles Bishop, of San Francisco; Vice-Pres., E. A. Heron, of Oakland; Secy., Daniel Grant; directors, John R. Spring and Saml. C. Bigelow, of San Francisco.

LOS ANGELES, CAL.—S. W. Bugbee, Charles Forman, Chas. H. Howard, of Chicago, Ill.; Lyman Bridges, of San Francisco, and Wm. H. Knight, of the Mount Lorne R. R., are interested in the projected bicycle railway between Santa Monica and San Bernardino, described last week.

SANTA BARBARA, CAL.—Messrs. Reed, Ashton and others have petitioned the council for a franchise for an electric railway.

ELECTRIC LIGHT AND POWER.

PORTLAND, ME.—There is talk of constructing an electric light plant at Peak's Island, at an estimated cost of $5,000, according to reports.

ENFIELD, N. H.—It is reported that the construction of an electric light plant is being discussed.

PEABODY, MASS.—The town has appropriated $8,000 for increasing the capacity of the electric light plant.

RAINBRIDGE, N. Y.—It is reported that a company is about to be organized to put in an electric light plant, estimated to cost $8,700.

NEW YORK, N. Y.—The Edison Electric Illuminating Co. has voted to issue $15,000,000 of 100-year 5% bonds, a portion of which, it is reported, will be used for extending the plant in the upper part of the city.

TRENTON, N. J.—The Pennsylvania & New Jersey Power Co. has been granted permission by the legislature to construct a dam half-way across the Delaware River at Trenton Falls. It is estimated that 6,000 H.P. can be developed. There is also talk of constructing a dam all the way across the river. The company has a capital stock of $500,000.

HOMESTEAD, PA.—The council is about to award a contract for lighting the streets, and it is stated that the company will erect a new plant, estimated to cost $40,000.

PHILADELPHIA, PA.—The electrical department will soon begin laying conduits on several streets, so as to enable the telegraph and telephone companies to place their wires underground and utilize the city conduits.

CHARLOTTESVILLE, VA.—It is reported that the Jefferson Park Co. wants bids for an electric light plant. F. B. Peyton, Secy.

RICHMOND, VA.—Benj. T. August, Cy. Clk., writes us that no definite steps have been taken towards an electric light plant. The matter has been referred to the committee on finance for consideration.

GREENSBORO, N. C.—Bids are asked until April 26 for lighting this city with electricity. A. M. Scales, Cy. Clk.

TAMPA, FLA.—The Consumers' Electric Light & St. R. R. Co. is reported as having decided to increase its plant to supply 4,000 to 5,000 additional lights.

DOTHAN, ALA.—H. A. Pearce, Mayor, writes us that no electric light plant will be put in this season.

LIVINGSTON, ALA.—It is reported that a municipal electric light plant is to be erected. W. K. Smith, Secy Commercial Club, is interested.

GREENVILLE, KY.—W. H. Wilkinson, Cy. Engr., writes us that the construction of an electric light plant is being considered.

OWENSBORO, KY.—The council is about to advertise for bids for an electric light plant, to consist of two 60-light arc dynamos, an incandescent dynamo, three 125-HP. boilers, one 175-HP. and one 120-HP. engine.

KNOXVILLE, TENN.—It is reported that the Excelsior Electric Co., of New York, has made a proposition to the council for the construction of an electric light plant, estimated to cost $40,000.

BELLEVILLE, MICH.—Press reports state that a number of Chicago capitalists, headed by A. E. Coy, have completed arrangements for a big water-power project near this place. While they will not divulge the purpose to which this power is to be applied, yet certain indications show that they propose to transmit electricity to Detroit, a distance of 22 miles, and use it there for street railway and lighting purposes. Their plan is to dam the Huron River at French Landing, two miles below here, where they can easily obtain a head of 30 ft. of water and a big area for reservoir. They have obtained option from the farmers whose land will be thus submerged, and are making a deal with the Paeliant mill owners here. The land to be used is now being surveyed by engineers from Chicago.

CHELSEA, MICH.—The Chelsea Electric Light Co. is about to be awarded a contract for lighting this place with electric lights.

EATON RAPIDS, MICH.—The city recently issued $35,000 in bonds for an electric light plant and water-works system, but it is found that the issue is illegal, according to reports.

FLUSHING, MICH.—Press reports state that the citizens have voted to issue $20,000 in bonds for an electric light plant and water-works system.

HOLLAND, MICH.—Geo. H. Sipp, Cy. Clk., writes us that the citizens voted April 1 on a proposition to issue $12,000 in bonds to improve the electric light plant. The improvements will include a condensing engine, boiler, condensers for both engines, 1,500 light dynamo, foundation and change in building, etc. No bids have yet been asked or contracts awarded.

MANISTIQUE, MICH.—The question of having electric lights is being discussed, according to reports.

PORT HURON, MICH.—The proposition to issue $30,000 in bonds for an electric light plant was voted on April 1, according to reports.

EVANSTON, ILL.—It is reported that an election will be held April 16 to vote on the proposition to issue $38,000 in bonds for an electric light plant.

ROSSVILLE, ILL.—S. W. McGuire, Village Clk., writes us that the trustees have granted a franchise for an electric light plant and telephone exchange.

ARCADIA, WIS.—It is reported that a company will be organized, with a capital stock of $6,000, to build an electric light plant and water-works system.

EAU CLAIRE, WIS.—C. A. Alderman, Cy. Engr., writes us that the council has granted a 20-year electric light franchise to D. R. Moon and others. The power for the plant will be obtained from dams which have been used for saw mills and log reservoirs. The company will be in competition with an existing electric light company.——The Eau Claire Electric Light Co. is considering proposed improvements, to cost $250,000, according to reports.

WEST SALEM, WIS.—S. D. McMillan has been granted a franchise for an electric light plant. Power will be secured at Neshonoc, 1½ miles from this place.

CASCADE, IA.—Bids are asked for the construction of an electric light plant. H. L. Dehner, Secy. Cascade Electric Light & Power Co.

WINONA, MINN.—The citizens are soon to vote on a proposition to issue $55,000 in bonds for an electric light plant.

MOUND CITY, MO.—It is reported that the question of voting on a proposition to issue $15,000 in bonds for an electric light plant is being considered.

TORONTO, ONT.—Bids are asked until April 9 for a steam boiler for the Island Park electric light station. John Hallam, Chn. Com.

NEW COMPANIES.—Mattawa Electric Light & Power Co., Limited, Mattawa, Ont.; capital stock increased from $10,000 to $50,000.

Saranac Lake Electric Light Co., Harrietstown, N. Y.; $30,000; Orlando Blood, Wallace Murray, O. S. Morse.

Cascade Electric Light & Power Co., Cascade, Ia.; $7,000; Pres., D. M. Finney; Vice-Pres., D. P. Freeman; Secy., H. L. Dehner; Treas., James W. Bently.

Multiphase Motor Co., New York, N. Y.; $200,000; to manufacture electric motors, machinery and appliances; Alfred S. Brown, Watson D. Schram, New York; G. W. Gardneir, Nyack.

Electrolytic Insulating & Conduit Co., Springfield, Ill.; $5,000,000; to manufacture electric ducts, conduits, cables and electrical apparatus; H. Clay Wilson, Benj. J. Nudson, James F. Henderson.

BRIDGES.

BELFAST, ME.—L. H. Murch, Cy. Clk., writes us that there is no probability that a bridge will be built across the harbor for several years.

DURHAM, ME.—A town meeting will be held April 8 to raise money for a proposed bridge.

CHELSEA, MASS.—A bill has passed the house compelling the Boston & Albany R. R. Co. to build a bridge over its tracks at Matthews St. in this city.

CHICOPEE, MASS.—The aldermen have voted unanimously to authorize the building of a bridge at the Falls, at the cost of $27,000.

GREENFIELD, MASS.—Chas. J. Day is reported as preparing plans for a proposed bridge across the Connecticut River, 650 ft. in length.

WATERTOWN, MASS.—Effort are being made to secure the construction of a bridge across the Charles River at this place, several thousand feet below the present bridge on Galen St.

PROVIDENCE, R. I.—Bids are asked until April 17 for a steel highway bridge, as stated in our advertising columns. Robert E. Smith, Comr. Pub. Wks.

COHOES, N. Y.—The governor has signed a bill appropriating $4,000 for a bridge across the canal at Manor Ave., in this city; also a bill appropriating $4,000 for a bridge at High St., in this city.

FAIRPORT, N. Y.—Bids are asked until April 9 for building a wrought iron bridge over the Erie Canal at Main St., in this village. Geo. W. Aldridge, Supt. Pub. Wks., Albany.

PORTAGE, N. Y.—It is stated that it will cost this town and Genesee Falls about $4,000 to replace the iron bridge over the Genesee River, which was destroyed by ice.

UTICA, N. Y.—The governor has signed a bill appropriating $34,000 for canal bridge improvements in this city and authorizing the city to spend $8,000 for a similar purpose.

NORRISTOWN, PA.—It is stated that a bridge is to be built across the Schuylkill River at Airy St., 125 ft. long, with a western approach of 240 ft. and an eastern approach of 3,900 ft.

PHILADELPHIA, PA.—The contract for the superstructure for the proposed Delaware River bridge has been awarded to the Pencoyd Iron Works, as noted in our issue of last week. This company has since been awarded the contract for about 2,000 tons of structural work for the two approaches. It is stated that the western approach will be 2,200 ft., and the eastern approach 400 ft. long.

PITTSBURG, PA.—The Rankin Bridge Co. was incorporated March 29, to construct a bridge over the Monongahela River from Rankin to Mifflin township; capital stock, $1,000; Treas., C. Cramer, Allegheny, Pa.

CHESTERTOWN, MD.—The Kent county commissioners are reported to have decided to build a new bridge at Price's mill.

GAINESVILLE, GA.—Bids are asked until April 25 for the construction of a bridge across the Chattahoochee River. Address J. E. Redwine.

NEW ORLEANS, LA.—It is reported that bids will soon be asked for constructing a number of iron and steel bridges.

EAST LIVERPOOL, O.—The Wrought Iron Bridge Co., of Canton, O., is reported to hold an option for two weeks on the contract for the construction of the proposed bridge across the Ohio River at this place, the contract price being about $275,000.

KENTON, O.—Bids are asked until April 22 for the construction of a wrought iron highway bridge across the Scioto River in Dudley township. M. M. Thompson, Audr.

TOLEDO, O.—Local papers state that the following bids were received March 27 for the construction of a new bridge across the Maumee River:

	Roadway. 24-ft.	Roadway. 32-ft.
Keepers, Winchof & Shacher....	$198,300	$222,000
	195,000	218,000
Ohio Bridge Co., Toledo, O.....	189,000	215,000
Wrought Iron Bridge Co., Canton.	196,000	.....
Massillon Bridge Co., Massillon, O.	192,000	216,000
King Bridge Co., Cleveland, O...	199,000	225,000
* Toledo Bridge Co., Toledo, O.(1)	185,000	(4) 194,500
	189,000	215,000
	(2) 195,000	(5) 208,000
	(3) 200,000	.....
Youngstown Bridge Co., Y'ngst'n.	195,000	.....
Penn Bridge Co., Beaver Falls, Pa.	192,000	220,000

* If through draw is used in deck bridge, add $5,000; if through span is used over Wabash track, add $1,500; if concrete or timber is used in piers, 2, 3, and 4, deduct $5,000. Contract awarded to the Toledo Bridge Co., at $185,000.

ELKHART, IND.—The city clerk writes us that no new bridge will be built, but that new abutments will be constructed for the old bridge.

ADRIAN, MICH.—John Mawdsley, Cy. Clk., writes us that no action has yet been taken in reference to the proposed bridge across the railway tracks.

CHICAGO, ILL.—The city engineer has notified the Chicago City Ry. Co. that it must not run electric cars across the Archer Ave. bridge. The city engineer recently petitioned for an appropriation of $160,000 for a new bridge, but no appropriation has yet been made.

DAVENPORT, IA.—E. W. Boynton, Comr. Pub. Wks., writes us that the plans for the proposed bridge across the Mississippi River have been approved by the secretary of war, and the bridge company is now awaiting the action of the citizens on the question of voting a tax of $100,000 to aid in the construction.

GLENDIVE, MONT.—Bids are asked until April 20 for the purchase of $39,000 of 6% bridge bonds, and until May 15 for the construction of a pivot drawbridge over the Yellowstone River. Jas. McCormick, County Clk.

DENVER, COLO.—E. P. Martin, Ch. Engr., Dept. Pub. Wks., writes us that the following bids were received for the metal superstructure of the Broadway bridge across Cherry Creek, as advertised in Engineering News:

Youngstown Bridge Co., Y'ngst'n, O. (aw'd con.)	$29,500
Milwaukee B'dge & Iron Wks., Milwaukee, Wis.	34,000
Wrought Iron Bridge Co., Canton, O.	35,400
Pittsburg Bridge Co., Pittsburg, Pa.	34,500
Bullen Bridge Co., Pueblo, Colo.	41,787
American Bridge Works, Chicago, Ill.	35,200
Penn Bridge Co., Beaver Falls, Pa.	36,800
Farnsworth & Blodgett, Kansas City, Mo.	35,640
Missouri Valley B'dge & Iron Wks., Leavenw'th.	34,860
The King Bridge Co., Cleveland, O.	31,500
The Toledo Bridge Co., Toledo, O.	35,500

BUILDINGS.

BUFFALO, N. Y.—St. Anna's congregation will build a 3-story brick parochial school, adjoining its church on Emslie St., near Broadway, to cost $100,000. Niederpruem & Co. prepared the plans.——The Pencoyd Iron Works, of Philadelphia, has secured the contract for furnishing the steel work for the new Guaranty building. The contract for the white enamel brick has been awarded to the Tiffany Brick Co., of Momence, Ill. The terra cotta contract has been awarded to the Northwestern Terra Cotta Works, of Chicago.

NEW YORK, N. Y.—The Siegel Construction Co., 65 and 67 Wooster St., has filed plans for a 6-story brick store to be built on 6th Ave., between 18th and 19th Sts., at a cost of $1,550,000.

WEST SENECA, N. Y.—Milton and S. Churchill, grain dealers of Toledo, have announced their intention of constructing a grain elevator, with a capacity of 250,000 bushels, at this place.

WASHINGTON, D. C.—Bids are asked as follows: Until April 13 for the 2d story columns and the 3d floor beams and girders, etc., in the U. S. public building at St. Paul, Minn.; April 18 for the 1st, 2d and 3d story columns, 2d, 3d and 4th floor beams, etc., for the U. S. public building at Kansas City, Mo.; and until April 23 for the erection and completion of the

marine hospital building at Gulf Quarantine Station, at Ship Island, Miss. Chas. E. Kemper, Acting Supervising Arch., Treasury Dept.

BALTIMORE, MD.—Bids are asked until April 18 for the construction of a temporary structure for the accommodation of the courts during the erection of the new court house. J. Theo. Oster, Inspector of Building.

CUMBERLAND, MD.—G. B. Hazlehurst, Supt. Motive Power, Baltimore & Ohio R. R. Co., Baltimore, Md., writes us that Baldwin & Pennington, Archs., of Baltimore, will soon ask for bids for the construction of a round-house and small shop attached at this place.

WRIGHTSVILLE, GA.—Bids are asked until May 20 for the erection of a court house for Johnson county. Specifications can be seen at the office of Golucke & Stewart, Atlanta, Ga. Brick can be delivered at $4.50 per M., sand at 5 cts. per cu. yd., and lumber at $6 to $10 per M. ft. J. H. Hicks, Secy.

LANSING, MICH.—Contract for the construction of the new city hall has been awarded to Chas. M. Chittenden, of Lansing, at $108,000.

CHICAGO, ILL.—Bids are asked until April 8 for the erection of an 18-room and a 22-room school building. Address Board of Education, Schiller Bldg.

CHICAGO, ILL.—F. M. Atwood has had plans drawn for a 13-story office building, to occupy the northwest corner of Clarke and Madison Sts., estimated to cost $250,000. The construction is expected to commence May 1.

ST. JOSEPH, MO.—Bids are asked until April 11 for the erection of a new union station. E. J. Eckel, Arch.

ST. JAMES, MINN.—Bids are asked until April 15 for the purchase of $30,000 in 5% court-house bonds. The county commissioners will meet at that date to consider plans and specifications for a court house, to cost not more than $30,000. Theo. Sonsteby, Clk. County Comrs.

HALIFAX, N. S.—Bids are asked until April 16 for the extension of two buildings at the College of St. Francis Xavier; also for heating these buildings with steam or hot water. Arch., J. C. Dumaresq, 195 Barington St.; B. S. Chisholm, Secy. Bd.

WATER-WORKS.

YARMOUTH, ME.—Geo. W. Hammond, L. L. Shaw and A. T. Small are members of the committee having in charge the construction of works, for which the town has voted to issue $40,000 in bonds.

DERRY, N. H.—The Derry Water-Works Co. is reported about to extend its service to Nortonville, one-half mile distant from the depot.

BENNINGTON, VT.—The village is taking steps to purchase the works. John H. Kelso, Clk.

BOSTON, MASS.—The water board received bids April 4 for the construction of filter beds near Marlboro Junction.

CAMBRIDGE, MASS.—L. M. Hastings, Cy. Engr., informs us that the lowest bid for constructing the Winter St. dam and appurtenances was that of the Standard Construction & Supply Co., Easton, Pa., at $116,274. A large table giving the itemized bids was crowded out of this week's issue, but will probably be published next week.

CHELMSFORD, MASS.—Geo. A. Parkhurst, Town Clk., writes us that no plans for works have been agreed upon. A committee will report at the next annual meeting, March, 1896. Chn., H. A. Cornell.

MEDFORD, MASS.—The following bids were received April 1 for laying a 20-in. water main from Spot Pond to Wright's Pond, as advertised in Engineering News; the bids being for work to be done in either July, August or September:

	Work done in		
	July.	August.	Sept.
Samuel J. Cronin, Boston..	$21,966	$20,631	$19,242
Joseph Bruno, Boston.....	19,142	18,148	17,424
F. A. Snow, Boston.....	18,898	17,519	17,249
Trumbull & Ryan, Boston..	19,399	16,578	15,877
E. McManus, Waterbury...	15,875	15,735	15,735
F. L. Allen, Worcester.....	32,989	30,325	27,661
H. S. French, Newtonville..	32,989	30,325	27,661
A. W. Byrne, Medford.....	19,686	18,216	18,216
Weaving, Booth & Gow...	26,376	23,436	19,296

NORTH BROOKFIELD, MASS.—The legislative committee on water has voted unanimously against the application of this town to borrow $20,000 for extending the works. Another town meeting will be held April 5 to discuss the question.

PEABODY, MASS.—The town has appropriated $3,300 for extending the water mains.

PITTSFIELD, MASS.—The Onota Water Co. is being organized by A. J. Waterman, H. C. Valentine and others to supply that part of the town west of the Housatonic River.

SAUGUS, MASS.—The town has voted to issue $5,000 in bonds for the extension of the works.

WOONSOCKET, R. I.—Press reports state that about 20 bids were received for building the proposed dam, the prices not varying $3,000 from $37,000.

CROMWELL, CONN.—A. Boardman, Town Clk., writes us that no steps have yet been taken toward the construction of works.

WATERBURY, CONN.—Bids are asked until April 16 for the construction of an earth dam, as stated in our advertising columns. R. A. Cairns, Cy. Engr.

AFTON, N. Y.—At the recent charter election $200 was appropriated towards securing surveys for a system of water-works.

BROCTON, N. Y.—J. H. Cobb, Clk., writes us that the water-works proposition has been voted down, but that it will come up again in the near future.

CLINTON, N. Y.—L. I. Richardson, of Owego, N. Y., has been awarded the contract for constructing a system of water-works for Hamilton College.

CORNWALL, N. Y.—The citizens have voted in favor of a tax to put in works.

FREEPORT, N. Y.—The contract for the extension of the works has been awarded to L. I. Richardson, of Owego, N. Y.

LESTERSHIRE, N. Y.—E. H. Codding, Village Clk., writes us that he does not think that the trustees will do anything about works this year.

RHINEBECK, N. Y.—J. C. McCarthy, Village Clk., writes us that it is not probable that works will be put in at present.

MORRIS, N. Y.—The trustees have rejected all the bids for constructing works and will do the work by day labor, upon the recommendation of J. Warren Lamb, Engr.

ROCKVILLE CENTER, N. Y.—The construction of works was favorably voted upon April 1. This question was carried at an election last fall, but the legality of the election was contested on the ground that other than taxpayers had voted. It is stated that plans will be secured at once.

SAUGERTIES, N. Y.—The clerk writes us that the question of putting in new works has not yet been decided.

STAMFORD, N. Y.—The village trustees have voted to grant a franchise for new works, provided the vested rights of the Stamford Water Co. are not interfered with, and that the cost of fire hydrants shall not exceed $15 each a year, and the village to have the right to purchase.

HIGHTSTOWN, N. J.—A. S. Voorhees writes us that the council has called an election, to be held May 6, to vote on an issue of $20,000 in bonds for works.

ALLEGHENY, PA.—Mayor Kennedy is advocating a scheme for a joint water supply for this city and Pittsburg. It is proposed to build an immense storage reservoir on the hill above the new pumping station at Nine-Mile Island.

CORRY, PA.—Geo. D. Gilbert, Cy. Engr., writes us that the contract for works has been awarded to J. F. Witmer, of Buffalo, N. Y., representing Eastern parties. The work will include a pumping station, two 2,000,000-gallon pumps, about 14 miles of mains, 100 hydrants and a concrete-lined 4,000,000-gallon reservoir; work to be commenced before June 1, and to be completed by Dec. 31.

ERIE, PA.—Bids are asked until April — for laying a 60-in. cast iron conduit into Erie Harbor, as stated in our advertising columns. Wm. Himrod, Secy. Comrs.

HAZLETON, PA.—The "Sentinel," of this city, states that the Lehigh Valley R. R. Co. is preparing to spend nearly $500,000 in this section to secure a permanent water supply. Alonzo P. Blakeslee, of Delano, is the engineer in charge of the work.

HOMESTEAD, PA.—Bids are asked until April 22 for the erection of a 3,000,000-gallon pump, as stated in our advertising columns. S. B. Depuey, Cy. Clk.; Thos. H. Williamson, Chn. Com.

MEADVILLE, PA.—The application for an injunction restraining the city from issuing $75,000 in bonds for new works has been refused.

MONACA, PA.—The council has appointed a committee to secure estimates as to the cost of works.

OIL CITY, PA.—Bids are asked until April 16 for a 5,000,000-gallon pumping engine. A. M. Breckinridge, Clk. Comrs.

PHILADELPHIA, PA.—The council has voted to lay mains in a large number of streets.

READING, PA.—The city clerk is reported about to advertise for bids for water-works supplies.

SEAFORD, DEL.—E. F. Prettyman, Secy. Council, writes us that the matter of water-works has been indefinitely postponed.

HYATTSVILLE, MD.—W. H. Richardson, Town Treas., writes us that it is uncertain what action the town commissioners will take in regard to works; what is wanted most is a competent engineer to submit plans and estimates.

MOUNTAIN LAKE PARK, MD.—L. A. Rudisill, Supt. Park Association, writes us that Hoge & White, of Wheeling, W. Va., are preparing plans and specifications for works, but that the construction will not be commenced before next fall or later.

SNOW HILL, MD.—John R. Moore, Mayor, writes us that $18,000 has been appropriated for works, but that no contracts have yet been awarded.

CUTHBERT, GA.—Robert L. Moye, Mayor, writes us that the following bids were received for the construction of a complete system of works, as advertised in Engineering News:

(1) Herbert & Lapeyre, Chattanooga, Tenn.	$37,893
(2) R. D. Cole Mfg. Co., Newnan, Ga.	38,483
(3) George O. Tenney, Chattanooga, Tenn.	39,084
(4) Howard, De Long & Co., Lexington, Ky.	39,510
(5) Howard Neeley, Chattanooga, Tenn.	39,800
(6) Walton & Wagner, Rome, Ga.	40,789
(7) J. N. Hazlehurst & Co., Atlanta, Ga.	43,444
(8) Vedeler & Long, Bessemer, Ala.	43,683
(9) Gaboury & Brown, Jacksonville, Ala.*	44,000
(10) Portsmouth F. & M. Wks., Birmingham*	44,000

* Not consolidated; about.

All the bids exceeded the appropriation, and were rejected, and modified plans placed in the hands of Nos. 1, 2, 4, 5 and 9, and new bids submitted. The bid of Howard, De Long & Co. was then accepted, at $33,000, and was approved by the Mayor and council.

MONTEZUMA, GA.—C. H. Richardson writes us that the construction of two artesian wells will begin April 10. The contract was awarded on March 15 to A. H. Wooten, of the Artesian Well Co., of Wadley, Ga., at $500 each, as noted in our issue of March 21.

DOTHEN, ALA.—H. A. Pearce, Mayor, writes us that no action has been taken in regard to works, as the council is now waiting for the well contractors, who have not yet succeeded in getting water.

MORRISTOWN, TENN.—R. F. Taylor writes us that the committee is now taking the preliminary steps for works; supply from springs; population, 4,200.

ASHLAND, KY.—The works and franchise of the Ashland Water Supply Co., have been purchased by the bondholders for $67,000. The plant will be operated the same as heretofore.

ELIZABETHTOWN, KY.—Chas. T. Warren, Cy. Clk., writes us that nothing has yet been done in regard to works.

GREENVILLE, KY.—W. H. Wilkinson, Cy. Clk., writes us that there is talk of putting in works and an electric light plant, but that the council has not yet taken any action in regard to either improvement; population, 1,000.

CAMBRIDGE, O.—Plans and specifications for works will be completed about April 15. Cy. Engr., O. M. Hoge; Consult. Engr., E. C. Cook, of Cleveland.

CINCINNATI, O.—Bids are asked by the board of administration until April 22 for a supply of pipe, valves, brass castings, etc.

COLUMBUS, O.—The state board of health has accepted a report from Allen Hazen recommending that the supply from the Scioto River be filtered or that efforts be made to secure a supply from driven wells on the west side.

HICKSVILLE, O.—E. L. Clay writes us in regard to the report that an election will soon be held to vote on an issue of $10,000 in bonds for extending the works, that there will be no construction this year.

PORTSMOUTH, O.—The trustees have awarded a contract for a 4,000,000-gallon pump to the Laidlaw-Dunn-Gordon Co.

TOLEDO, O.—Bids are asked until April 8 for boring an artesian well at the corner of Nebraska Ave. and 15th St. L. P. Harris, Cy. Clk.

YELLOW SPRINGS, O.—The village trustees are reported as considering plans and specifications for works.

ANGOLA, IND.—The contract for a 3,000,000-gallon pumping engine is reported to have been awarded to the Holly Mfg. Co.

FORT WAYNE, IND.—The city has contracted with the Wagner Water Supply Co. to blow out the 35 gravel wells belonging to the city, at a cost of $2,575. ——C. B. Oakley, Mayor, has been authorized to appoint a committee of prominent citizens to act with the committee already appointed to investigate plans for a permanent water supply.

EATON RAPIDS, MICH.—The city recently issued $35,000 in bonds for municipal water-works and electric lights, but it is now stated that the issue was illegal.

HOLLAND, MICH.—Geo. H. Sipp, Cy. Clk., writes us that an election was held April 1 to vote on an issue of $6,000 in bonds for water-works extensions, and $12,000 for electric lights. The work will include an engine, boiler, stack and setting, changes in suction pipe and mains, etc.

FLUSHING, MICH.—The citizens have voted, 215 to 30, in favor of issuing $20,000 in bonds for water-works and an electric light plant.

MANISTIQUE, MICH.—It is stated that works will soon be put in for fire protection.

BLOOMINGTON, ILL.—The contract for furnishing a temporary water supply of 4,000,000 gallons a day has been awarded to Geo. C. McIntosh, of Bloomington, at $3,015. The city will probably advertise for bids for a permanent supply.

BUDA, ILL.—At a recent mass meeting press reports state that the citizens voted to issue bonds for works, and a committee was appointed to get estimates.

HIGHLAND PARK, ILL.—It is reported that the works will soon be extended to the adjacent village of Highwood.

KNOXVILLE, ILL.—The contract for hydrants and valves for the new works has been awarded to the Michigan Brass & Iron Wks., of Chicago.

SHEFFIELD, ILL.—The city council is reported to have voted to issue bonds for works.

ARCADIA, WIS.—A company is being organized with a capital stock of $6,000 to put in works and a new electric light plant.

CASSVILLE, WIS.—Otto Reinke, Village Clk., writes us that there will be no works put in this year, as the legislature did not grant permission to issue bonds.

GRAND RAPIDS, WIS.—Press reports state that on April 23 a jury will be appointed to condemn property for the use of the city in building a system of water-works.

NEW LISBON, WIS.—J. H. Crandale writes us that no steps will be taken to put in new works this year.

SPARTA, WIS.—The bids received March 19 for constructing works were published last week. We are informed that the contract has been awarded to W. S. Wagner, of St. Paul, at $23,600, which is $1,600 in excess of the amount of bonds voted. An election to vote on an issue of $1,600 additional bonds was held April 2. Howard Teasdale, Cy. Clk.

WAUKESHA, WIS.—George Parsons, Pres. Waukesha Water Co., has been appointed receiver for the company.

CASCADE, IA.—Bids are asked until May 1 for the purchase of $10,000 in 20-year 5% water bonds. The works are now being constructed by the Smedley Mfg. Co., of Dubuque, at a contract price of $11,000. J. H. Weber, Cy. Clk.

COLUMBUS JUNCTION, IA.—Fairbanks, Morse & Co. have submitted plans for works, for which $10,000 in bonds have been voted.

MUSCATINE, IA.—The contract for constructing works at the county farm has been awarded to N. Barry & Son, at about $2,400.

IOWA CITY, IA.—Charles S. McGowan, Cy. Engr., writes us that the city has decided not to purchase the works at present.

NEODESHA, KAN.—The Neodesha Water Co. has been organized, with a capital stock of $25,000; Pres., H. H. Arthur; Vice-Pres., A. C. Houston; Secy. and Treas., A. L. Hill.

TOPEKA, KAN.—The city engineer is reported to have completed plans for new works, including 70 miles of mains. The present system is said to have but 33 miles of mains in the city.

SPRINGFIELD, NEB.—J. D. Quinley writes us that an election will soon be held to vote on the question of works; population, 1,000. S. C. Haney is the official in charge.

BERESFORD, S. DAK.—Several propositions are being considered for the construction of works, and it is stated that a contract will be awarded not later than April 5.

FORT SHAW, MONT.—Bids are asked until April

19 for constructing works at the U. S. Indian Industrial School. W. H. Winslow, Supt.

ST. LOUIS, MO.—The lowest bid for laying pumping main No. 7 was that of Thompson & Gray, at $18,060, and that for laying 36-in. mains on Blair Ave., R. J. McDonald, at $5,471.

HELENA, ARK.—The Helena Water Co.'s plant has been sold by the sheriff to Robert M. Foster, of St. Louis, on a first mortgage judgment of $60,000.

CORSICANA, TEX.—The securing of a daily supply of 350,000 gallons of water a day from an artesian well was noted last week. This well is 2,487 ft. deep, and cost $12,051. It is stated that two additional wells have been contracted for, and will be sunk at once, and that a complete system of water-works will be put in. Jas. L. Autry, Pres. Corsicana Water Development Co.

DALLAS, TEX.—The contract for a 10,000,000-gallon pumping engine has been awarded to the Holly Mfg. Co. The bids were published March 21.

HUTTO, TEX.—The citizens are reported as agitating the question of a water supply.

FLATONIA, TEX.—H. S. Palmer, Cy. Secy., writes us that there are no plans on hand at present for works in this city; population, 1,400.

WACO, TEX.—T. C. Tibbs, of Waco, has been appointed receiver for the Waco Water & Light Co.

NORMAN, OKLA.—Bids are asked until April 15 for the construction of works, according to a press report. Address J. A. Jones.

WOODS, WASH.—The question of works is reported as being agitated.

MONROVIA, CAL.—Bids are asked until April 6 for the construction of certain iron pipe mains in Sycamore and Vassar canyons. W. H. Evans, Cy. Clk.

VENTURA, CAL.—The water company has offered to sell the water-works for $106,500, and the electric light plant for $23,500, and it is stated that the committee will recommend the purchase at this price. Geo. C. Powers, Cy. Engr.

VISALIA, CAL.—The Visalia City Water Co. is reported as contemplating improvements, to cost about $30,000, including a new pumping engine.

NIAGARA FALLS, ONT.—John Robinson, Secy., writes us as follows: There was talk of a new reservoir during the water famine in the cold winter weather. The winter is now over, and there will be no more scarcity of water until the cold weather of next winter, and probably no more talk of a reservoir until that time.

IRRIGATION.

SAN SABA, TEX.—Press reports state that John T. Smith, a civil engineer of Austin, has filed in the county clerk's office a sworn statement, as required under the late irrigation act appropriating the water of the Colorado River for irrigation near the upper end of Big Valley in San Saba and Mills counties, proposing to irrigate 500 acres approximately.—It is reported that work will begin in about 30 days on the construction of a dam and irrigation canals, estimated to cost $1,000,000.

PORTLAND, ORE.—Bids were received by Geo. W. McCoy, Secy., 284 Morrison St., March 27, for constructing nine miles of irrigating canals in Eastern Oregon, approximately 50,000 cu. yds. of earth and 3,000 cu. yds. of rock excavation.

NEW COMPANIES.—Texas Coast Canal Co., Corpus Christi, Tex.; $300,000; John B. Armstrong, Alice; A. Boshkee, San Antonio; William Deryer.

Cow Valley & Willow Creek Reservoir & Irrigation Co.; Pendleton, Ore.; $100,000; E. H. Test, A. W. Turner, J. L. Rand, J. S. Stark, I. W. Hope.

Riverside Land & Irrigation Co., Limited, Jennings, La.; $50,000; Pres., O. S. Dalby, Lake Charles; Vice-Pres., S. J. Johnson, Jennings; Secy. and Treas., E. F. Rowson.

Homestead Irrigation Co., Chicago, Ill.; $15,000,000; to manufacture apparatus, operate irrigation systems and pumping machinery; N. H. Hanchett, Ambrose A. Worsley, F. S. Baird.

SEWERAGE.

DOVER, ME.—C. W. Brown, Town Clk., writes us that the town voted at the spring election to build a system, which will probably cost $10,000. It is likely that the work will be done this season by contract, under the direction of the selectmen. Engr., P. H. Coombs, of Bangor.

EXETER, N. H.—Chas. G. Gooch, Chn. Selectmen, writes us that a new committee has been appointed to consider the question of constructing a system, estimated to cost $25,469. Edwin G. Eastman, Chn.

BRADFORD, VT.—Geo. W. Chapman, Village Pres., writes us that the committee appointed to investigate the feasibility and cost of a system has not yet acted, and probably nothing will be done at present.

WOODSTOCK, VT.—J. L. Dana, Clk., writes us that nothing has yet been done towards the construction of a system.

BOSTON, MASS.—Press reports state that the committee has reported in favor of a bill prepared by Chas. F. Light, of Hyde Park, providing a system for the Neponset Valley, to cost $500,000, and to include Dedham, Hyde Park, Milton, West Roxbury and a part of Dorchester. The sewer is to begin in West Roxbury and follow the valley of the Neponset River, connecting with the Boston sewer at Granite Bridge, Dorchester, from there pass through the Cow Pasture and be delivered at Moon Island. It is to be built by the metropolitan sewerage commissioners, and the cost is to be met in the same manner as the cost of the metropolitan sewerage system.

BROCKTON, MASS.—F. Herbert Snow, Cy. Engr., writes us that the question of constructing sewers this year is still before the council. Plans have been prepared, hoping that $250,000 will be appropriated.

CAMBRIDGE, MASS.—Bids are asked until April 6 for furnishing 28,000 lbs. of iron castings for the sewer department. L. M. Hastings, Cy. Engr.

HYDE PARK, MASS.—Robert Bleakie, Chas. F. Light, F. W. Darling and Percy M. Blake have been appointed a committee to consider plans for a system.

LAWRENCE, MASS.—A. D. Marble, Cy. Engr., writes us that a preliminary plan has been made for an 84-in. sewer to drain 1,130 acres, but that the committee has not yet considered the question, and no steps have been taken toward raising money or awarding contracts.

MALDEN, MASS.—Bids are asked until April 8 for constructing about 2,000 ft. of 36-in. brick sewers G. A. Wetherbee, Cy. Engr.

MEDFORD, MASS.—The following bids were received March 30 for constructing 20,477 ft. of pipe sewers, as advertised in Engineering News; T. Howard Barnes, Cy. Engr.:

Morgan, Booth Co., 4 Broad St., Trenton, N. J.	$15,812
A. Robblata, Box 612, Torrington, Conn.	16,966
John Sheehan & Co., 585 Western Ave., Lynn.	17,119
Gennaro, Long & Little, South Braintree.	17,295
J. J. Arthur & Co., 31 Worthington St., Boston.	17,357
Weaving, Booth & Gow, Medford, Mass.	18,472
Trumbull & Ryan, 209 Washington St., Boston.	18,578
Wm. H. Sherman, 568 Potter's Av., Providence.	18,929
Lindsay & Cudmore, 29 Knowlton St., Som'v'le.	19,184
Denniss O'Connell, 158 Adams St., Dorchester.	19,578
M. Eiffe, 1 North Sq., Boston.	19,824
F. H. Snow, 13 Broad St., Boston.	20,015
P. J. McCarthy, 36 Everett St., Everett.	20,280
A. W. Bryne, West Medford.	20,562
Frank L. Allen, 107 Foster St., Worcester.	20,566
Antonio Michelini, Reading, Mass.	21,184
Edw. Brigham, 34 School St., Boston.	21,436
Buttimer & Falvey, 15 Rush St., Somerville.	22,138
Crockett & Kelley, 89 Morrison St., Somerville.	22,707
D. F. McCarthy, 231 Oak St., Lawrence.	23,169
Burnett, Floyd & Horton, East Boston.	23,185

NEW BEDFORD, MASS.—Bids are asked until April 9 for furnishing sewer pipe during the year. A. B. Drake, Supt. Pub. Wks.

NEWTON, MASS.—It is reported that the citizens of Newton Lower Falls have petitioned the council for the immediate extension of the system to that place.

PITTSFIELD, MASS.—The council has passed an ordinance appropriating $30,000 for sewers.

BUFFALO, N. Y.—Bids are asked until April 16 for constructing a 12 and 10-in. pipe sewer in Florida St. and a 36 to 24-in. brick sewer in Roesch Ave. R. G. Parsons, Secy. Dept. Pub. Wks.

BROOKLYN, N. Y.—Bids are asked until April 15 for constructing a sewer in Crooke St. A. T. White, Comr. Cy. Wks.

FAR ROCKAWAY, N. Y.—Bids are asked until April 9 for constructing 4,000 ft. of storm sewer in two streets. W. J. McKenna, Clk.

HANCOCK, N. Y.—It is reported that $5,000 in bonds will be issued for sewers.

HASTINGS-ON-HUDSON, N. Y.—Bids are asked until April 18 for constructing a system, as stated in our advertising columns. Peter A. Hayes, Clk. Bd. Pub. Wks.

HORSEHEAD, N. Y.—A bill authorizing an appropriation of $10,000 for constructing a sewer has been introduced in the legislature.

KINGSTON, N. Y.—W. Klingborg, Cy. Engr., writes us that no steps have yet been taken toward constructing the proposed sewers.

NEW YORK, N. Y.—Bids are asked by the department of public works until April 16 for constructing sewers in seven streets.

ROCHESTER, N. Y.—Bids are asked until April 8 for constructing an outlet sewer in two streets, and a sewer in Lozier Park. Thos J. Neville, Clk.

WILLIAMSBRIDGE, N. Y.—A bill has been introduced in the legislature authorizing the construction of a system in Westchester outside of the limits of this city.

MORRISTOWN, N. J.—Rudolph Hering, of New York, has made a report to the Morristown Improvement Association on a system estimated to cost $166,000. A committee has been appointed, consisting of Henry W. Miller, P. H. Hoffman and J. F. Randolph. John R. Brinley is city engineer.

RED BANK, N. J.—A. C. Harrison, Town Clk., writes us that the matter of constructing sewers will soon be ready to present to the citizens to vote upon. Engrs., Hedenberg & Kinsley, of New York.

ROSELLE, N. J.—Carrol Ph. Bassett, Ch. Engr., Summit, N. J., informs us that the lowest bid received March 29 for constructing the outlet sewer about three miles in length, was that of Wm. H. Waters, Bayonne, N. J., at $17,341. The itemized bids will probably be published next week.

BEAVER FALLS, PA.—W. W. Kerr, Secy. of Council, writes us that nothing will be done towards the construction of sewers this year.

STEELTON, PA.—John D. Young, Secy. of Council, writes us that plans have been prepared by Geo. E. Waring, Jr., of New York, for 12 miles of 18 to 8-in. pipe sewers, estimated to cost $53,000. It is not probable that the work will be done this year.

WILLIAMSPORT, PA.—Bids are asked until April 18 for constructing 20 to 8-in. pipe sewers, as stated in our advertising columns. J. J. Galbraith, Cy. Clk.

KENSINGTON, MD.—The committee has recommended the construction of a sewage farm for the relief of Rock Creek. Jeremiah Blackburn and George Duvall are members of the committee.

NORFOLK, VA.—W. T. Brooke, Cy. Engr., writes us that A. I. Acker has been granted a franchise for a system in Brambleton Ward. No plans have been prepared, and it is not probable that the system will be constructed, as some method of sewage purification would be required.

PETERSBURG, VA.—John W. Hays, Cy. Engr., informs us that the following bids were received March 20 for constructing 4,650 ft. of 18 to 8-in. pipe sewers:

Hankins & Mosby, Richmond, Va.	$2,821
E. T. D. Myers, Jr., Richmond, Va.	4,985
Wm. J. Joyce	5,635
Graham & Riddle, Norfolk, Va.	4,424
A. C. Maynard, Richmond, Va.	3,333
John Kelley, Petersburg, Va.	3,120
E. Eichburg, Petersburg, Va.	3,800
R. B. Mitchell Co., Richmond, Va.	2,565
Vandgrift Mfg. Co., Petersburg, Va.	3,563

MANCHESTER, VA.—Bids are asked until April 25 for constructing 18 miles of 24 to 6-in. pipe sewers, average cut 5½ ft., also for furnishing materials, as stated in our advertising columns. Engr., Geo. E. Waring, New York; Cy. Engr., Edwin Mitchell; Chn. Com., A. D. Shotwell.

ATLANTA, GA.—An ordinance has been introduced in the council for the construction of an 18 to 8-in. pipe sewer in Pine St. Park Woodward, Cy. Clk.

NEWPORT, KY.—It is proposed to construct sewers in one district, at an estimated cost of $15,000.

PADUCAH, KY.—W. H. Patterson, Clk., writes us that no arrangements have been made or are likely to be made for constructing sewers this year.

CAMBRIDGE, O.—Plans and specifications for a sewerage system will probably be completed about June 1. Consult Engr., E. C. Cooke, Cleveland; Cy. Engr., O. M. Hoge.

ELYRIA, O.—C. H. Snow, Cy. Engr., writes us that 2,131 ft. of 12 to 8-in. brick sewers will be built this year.

NEWARK, O.—H. G. Kingsbury, Cy. Engr., writes us that plans are being prepared for 1,500 ft. of 20 to 15-in. pipe sewers, average cut 9 ft.

RIVERSIDE, O.—The council has passed a resolution for the construction of a trunk sewer, estimated to cost $2,500.

INDIANAPOLIS, IND.—The city engineer has been directed to prepare plans for 7,690 ft. of 24 to 6-in. pipe sewers in six streets.

BELVIDERE, ILL.—A. E. Jenner, Cy. Clk., writes us that a survey for sewers is being made and will be completed early in the season. The sewers will be put in before any paving is done.

LA GRANGE, ILL.—The village clerk writes us that plans and specifications are ready at the city engineer's office. The assessment for the work will come up in April term of court.

MAYWOOD, ILL.—Samuel H. Donalson, Jr., Village Clk., writes us that the trustees passed an ordinance recently for constructing a 24-in. brick and pipe sewer, with 10-in. laterals, estimated to cost $15,000. Engrs., Hill & Enricht.

COUNCIL BLUFF, IA.—S. L. Etnyre, Cy. Engr., writes us that he has just completed plans for enclosing Indian Creek through a part of the city. This may be built this summer.

GRINNELL, IA.—J. F. Wilson, Cy. Clk., writes us that Chas. P. Chase, of Clinton, Ia., has made a survey and is preparing plans for a system and about one mile of pipe sewer, estimated to cost $10,000, will probably be built this year.

IOWA CITY, IA.—Chas. S. Magowan, Cy. Engr., writes us that it is very likely that 2,200 ft. of 48-in. brick sewer will be built.

SUN RIVER, MONT.—Bids are asked until April 19 for constructing a system at the Indian Industrial School at Fort Shaw. Address W. H. Winslow, Supt. U. S. Indian School Service, Fort Shaw, via Sun River.

INDEPENDENCE, MO.—F. C. Florance, Cy. Engr., writes us that a new system may soon be constructed, according to a law lately passed by the legislature. Plans and specifications are not yet completed.

KANSAS CITY, MO.—The construction of a sewer in the east side, estimated to cost $5,000, is being discussed, and a committee has been appointed to confer with the board of public works.

ST. JOSEPH, MO.—P. B. Wright, Cy. Clk., writes us that nothing will be done on the big sewers until about June 15. C. W. Campbell, Cy. Engr.

ST. LOUIS, MO.—It is proposed to construct sewers in 10 streets, at an estimated cost of $223,500. R. R. Southard, Comr.

GARBAGE DISPOSAL.

BRIDGEPORT, CONN.—The board of health is reported to have entered into an agreement with W. H. Richardson, representing the Holthaus Co., for the construction of a garbage disposal plant, the city to pay a certain price per ton for all garbage disposed of for 10 years.

NEW BRIGHTON, N. Y.—The board of health and crematory committee are reported to have decided to recommend the erection of a Brownlee garbage crematory, manufactured by Brownlee & Co., of Dallas, Tex. The crematory is to have a capacity of 50 tons of garbage a day, and will cost $6,500, according to the report.

NEW YORK, N. Y.—The Sanitary Product Co. has been incorporated, to remove and utilize garbage, etc.; capital stock, $10,000; directors, Clarence B. Kugler, of Philadelphia; W. G. Gooch, Lawrence W. Ahrens, Oliver S. Campbell, and Noel Gale, of New York.

SYRACUSE, N. Y.—The American Reduction Co. has selected a site for its garbage disposal plant.

HOBOKEN, N. J.—The board of health has notified the council that the state laws and city ordinances in regard to the dumping of garbage will be enforced after June 1, and that all persons violating the sanitary code will be prosecuted. It is stated that the garbage contracts have heretofore been awarded annually, and that the contractor has disposed of the garbage by dumping it on the meadows or other convenient places, contrary to law. This city was recently granted authority to build a garbage crematory, and it is possible that the board of health will demand that the council dispose of the garbage in this way.

HELENA, MONT.—The contract for collecting and removing garbage from April 1, 1895, to June 30, 1896, has been awarded to Philip Brass at $5,165. There were 12 bids received.

STREETS AND ROADS.

MARLBORO, MASS.—The city engineer estimates the cost of paving Main St. with granite blocks at $33,000 to $38,000, or with sheet asphalt on a 4-in. Portland cement concrete foundation, at $48,500.

NEW BEDFORD, MASS.—Bids are asked until April 9 for furnishing granite paving blocks during the year. A. B. Drake, Supt. Pub. Wks.

BROOKLYN, N. Y.—Bids are asked until April 8 for paving portions of four streets with cobblestones and granite blocks, and until April 10 for repaving portions of nine streets with asphalt. A. T. White, Comr. Cy. Wks.

ELMIRA, N. Y.—Thomas Spence, Cy. Clk., writes us that the board of public works has just been organ-

ized, and has not had time to prepare definite plans for work during the year, but undoubtedly will soon do so. It is probable that several miles of paving will be laid this season. G. W. Nagle, Comr. Pub. Wks.; J. E. Rawlins, Cy. Engr.

NEW YORK, N. Y.—Bids are asked by the department of public works until April 16 for paving portions of four streets with asphalt on concrete foundations.

JERSEY CITY, N. J.—Bids are asked until April 11 for grading, building culverts, sewers, etc., and otherwise improving the road connecting the Hudson county public road with Weehawken; two contracts. John Boyd, Clk. Bd. Chosen Freeholders.

LONG BRANCH, N. J.—The question of grading and macadamizing Ocean Ave. is being considered. It is reported that $50,000 has already been secured for this purpose. Rufus Blodgett, Mayor.

NEWARK, N. J.—The governor has signed the bill authorizing this city to spend $1,000,000 for paving.

NORTH BRADDOCK, PA.—Bids are asked until April 6 for grading and paving the school yard at Bell Ave. and Anderson St. with asphalt, etc. A. C. Coulter, Secy., 98 Fourth Ave., Pittsburg.

WASHINGTON, D. C.—Bids are asked by the district commissioners until April 12 for constructing culverts on Albemarle St., between Grant road and Connecticut Ave.

BALTIMORE, MD.—The residents of Mount Royal Ave. have petitioned for the paving of the avenue with sheet asphalt, at an estimated cost of $100,000.——Portions of McCullogh St. and Carrollton Ave. are to be repaved with asphalt blocks.——A resolution has been introduced in the council for repaving Harlem Ave. with Belgian blocks at a cost of $16,000.

MONTGOMERY, ALA.—Bids are asked until April 29 for paving North Court St., from Coosa St. to Pollard St., with brick or granite blocks. R. H. Sommerville, Cy. Treas.

about 14,000 lin. ft. of asphalt paving, and for several minor improvements in grading and gravelling portions of certain streets, and brick and cement sidewalks in a number of streets.

TIPTON, IND.—L. Vernon Gould, Cy. Engr., writes us that the contract for paving 7,200 sq. yds. with brick, estimated to cost $18,000, will be awarded the last of April.

VEVAY, IND.—Bids are asked until May 4 for constructing 7½ miles of gravel roads in Switzerland county. Joseph E. Hart, Audr.

OMAHA, NEB.—Bids are asked by the board of public works until April 12 for paving one street with asphalt and grading several streets.

HELENA, MONT.—Bids are asked until April 25 for grading 1,125 lin. ft. of the Little Creek road. J. S. Tooker, Clk.

HELENA, MONT.—Bids are asked until April 25 for 10,000 cu. yds. of grading, 15,000 sq. yds. stone road and 1,144 sq. yds. of artificial stone sidewalks at Fort Harrison. Capt. Geo. S. Hoyt, Asst. Quartermaster, Fort Harrison.

KANSAS CITY, MO.—Bids are asked until April 10 for grading three streets, constructing stone sidewalks in one street and reconstructing Fifth St. H. H. Filley, Cy. Engr.

ST. LOUIS, MO.—The Gilsonite Paving Co., of St. Louis, has been awarded the contract for paving Cleveland Ave., from Grand Ave. to Tarr Ave., at $34,861. Engrs., Julius Pitson & Co.

OTTAWA, ONT.—Bids are asked until April 10 for paving two streets with asphalt. Robt. Surtees, Cy. Engr.

CONTRACT PRICES.

SEWERS.—Plainfield, N. J.—The lowest bid received March 25 for constructing about 17 miles of pipe sewers was noted last week under Sewerage. A. J. Gavett, Constrn. Engr., informs us that the bids were as follows:

30-in. pipe, Howard-Harrison Iron Co., Bessemer, Ala., $66,040; 83 tons of special castings, same firm, $3,388; 1,300 tons of 36-in. pipe, same firm, $25,805; 60 tons of special castings, same firm, $23,010; 29 stop valves, Coffin Valve Co., of Boston, at $3,158.75; 43 check valves, same firm, $4,765; 25 single-nozzle, post fire plugs, George J. Fritz, of St. Louis, $525; laying pump main No. 7, Thompson & Gray, of St. Louis, $18,090; laying 36-in. water pipe on Blair Ave., R. J. McDonald & Co., of St. Louis, $5,471.

CAST IRON PIPE.—Troy, N. Y.—We are informed that the water commissioners have awarded a contract for a carload, 10 tons, of 6-in. cast iron pipe to the Warren Foundry & Machine Co., at $21.20 per ton; 1½ tons specials, 1⅞ cts. per lb.

EDGESTONES, ETC.—Malden, Mass.—The following bids have been received by the street commissioners for furnishing edgestones, flagging and paving blocks:

	John Turner & Co.	S. & R. J. Lombard.	D. McDonald.
Edgestones, per ft.	$0.50	$0.47	$0.52
Circles, " "	.80	.63	.80
" to order, " "	1.15	.80	...
Large corners, per ft.	3.70	3.17	4.00
Small " " "	2.75	2.35	2.25
24-in. flagging, " "	.75	.64	.64
18 " " " "	.60	.53	.49
P'g blocks No. 1, per M.	42.00	37.00	43.50
" " " 2, " "	26.00	25.00	29.00

BRICK PAVING.—Indianapolis, Ind.—A correspondent writes us as follows: The contract for paving South Pennsylvania St. with brick on 6 ins. concrete was let March 23 to the Capitol Paving & Construction Co., at $5.99 per lin. ft. of each side of the street, Wabash Clay Co.'s standard block, stratified limestone curb and Portland cement filling to be used. The street is 1,260 ft. long and 60 ft. wide, has 9,329 sq. yds. of surface, 2,625 ft. of 5 × 24-in. straight curb, 75 ft. of curb cut to 6 ft. radius, 50 ft. of curb to be reset, 396 ft. of marginal stone, two catch basins, four

BIDS RECEIVED AT PLAINFIELD, N. J., MARCH 25, 1895, FOR CONSTRUCTING SEWERS.

Quantities.		Patrick Plunkett, Jersey City, N.J.	Rehill & Nelson, Dunellen, N. J.	Dodge & MacGregor, Buffalo, N.Y.	Maguire, McKnight & Co., E. Orange, N. J.	Gardner & Barnett Akron, O.	John H. Hurley, Trenton, N. J.	Thos. F. Moore, Buffalo, N. Y.	Bogert & Farrel, Brooklyn, N.Y.	Bernard Brady, Plainfield, N. J.	Thos. Redding, Perth Amboy, N. J.	M. Honan & Son, Chester, Pa.	James A. Cogan, Bayonne, N. J.	Wm. H. Watters, Bayonne, N. J.	Geo. W. Rich & Co., Philadelphia, Pa.	P. H. Harrison & Son, Newark, N. J.	Thos. Siddall, Trenton, N. J.	James F. Gillen, Brooklyn, N. Y.	Proot & Love, Plainfield, N. J.	John Marsden, Utica, N. Y.
24-in. sewer, under 8 ft. deep,	357 ft.	$1.60	$2.00	$1.28	$1.53	$1.50	$1.60	$1.64	$1.51	$1.43	$2.00	$1.27	$1.55	$1.25	$1.69	$1.50	$1.22	$2.63	$1.78	$1.18
" " 8 to 10 " "	430 "	1.70	2.00	1.53	1.62	1.60	1.70	1.71	1.61	1.81	2.00	1.40	1.85	1.50	1.73	1.65	1.34	2.73	1.80	1.35
" " 10 " 12 " "	280 "	1.80	2.00	1.80	1.71	1.70	1.95	1.83	1.71	1.88	2.10	1.51	2.00	1.70	1.78	1.85	1.43	2.83	1.85	1.45
12-in. " under 8 " "	2,224 "	.84	.66	.63	.70	.60	.53	.46	.61	.62	.90	.47	.45	.58	.68	.50	.47	.81	.65	.47
" " 8 to 10 " "	60 "	.94	.74	.69	.70	.65	.75	.55	.71	.89	1.00	.54	.70	.67	.70	.60	.56	.88	.70	.53
" cast iron pipe	36 "	2.40	2.25	2.25	2.50	3.50	2.75	1.87	2.00	1.58	1.55	2.00	1.15	1.50	1.00	1.00	2.00	1.50	2.00	1.15
10-in. sewer, under 8 ft. deep,	810 "	.55	.58	.51	.52	.55	.47	.40	.51	.55	.70	.41	.50	.50	.64	.43	.41	.76	.55	.42
" " 8 to 10 " "	1,990 "	.60	.68	.59	.54	.60	.50	.48	.57	.83	.75	.44	.63	.62	.69	.50	.49	.83	.57	.50
" " 10 " 12 " "	1,650 "	.65	.81	.76	.63	.65	.56	.50	.63	.94	.75	.48	.70	.70	.72	.56	.56	.88	.60	.58
" " 12 " 14 " "	475 "	.70	.95	.96	.72	.75	.75	.78	.69	1.25	.80	.56	.85	.92	.78	.68	.64	.93	.65	.69
" cast iron pipe	24 "	2.00	2.00	2.00	2.25	2.75	2.50	1.60	1.75	1.40	1.25	2.00	1.00	1.50	1.00	.80	1.50	1.50	2.00	1.00
8-in. sewer, under 8 ft. deep,	55,215 "	.39	.42	.39	.38	.35	.34	.28	.41	.41	.50	.29	.30	.45	.46	.36	.334	.60	.36	.34
" " 8 to 10 " "	21,435 "	.42	.45	.49	.44	.43	.39	.37	.47	.52	.50	.32	.40	.54	.51	.42	.412	.67	.43	.42
" " 10 " 12 " "	3,075 "	.45	.50	.64	.52	.48	.49	.42	.55	.90	.60	.42	.66	.67	.56	.50	.485	.72	.47	.52
" " 12 " 14 " "	880 "	.60	.55	.80	.63	.58	.77	.55	.61	.95	.65	.52	.80	.81	.61	.60	.56	.77	.50	.75
" cast iron pipe	48 "	1.75	2.00	1.50	1.75	2.50	2.00	1.34	1.50	1.05	.95	2.00	.90	1.50	1.00	.60	1.00	1.50	1.50	1.00
Junction man., under 8 ft. dp.	49	30.00	32.00	32.00	33.00	38.00	34.00	30.00	31.00	35.40	40.00	30.50	26.00	30.00	37.50	32.00	40.00	35.00	33.00	26.00
" " 8 to 10 " "	17	30.00	35.00	35.00	35.00	41.00	35.00	33.00	33.50	41.00	40.00	32.50	30.00	32.00	37.50	35.00	45.00	37.00	35.00	30.00
" " 10 to 12 " "	6	30.00	37.00	36.00	36.00	45.00	40.00	35.00	36.00	46.52	40.00	35.00	32.00	34.00	42.00	40.00	50.00	40.00	42.00	36.00
Plain manholes, under 8 " "	24	30.00	28.00	29.00	28.00	35.00	30.00	29.33	27.00	31.10	30.00	29.00	26.00	28.00	30.00	25.00	35.00	30.00	28.00	26.00
" " 8 to 10 " "	17	30.00	30.00	31.00	31.00	37.50	32.00	32.00	29.00	36.28	33.00	31.00	30.00	30.00	32.00	29.00	40.00	32.00	34.00	30.00
" " 10 " 12 " "	1	30.00	32.00	33.00	33.00	40.00	35.00	34.66	31.00	41.43	35.00	33.00	30.00	32.00	34.00	32.00	45.00	34.00	42.00	36.00
" " 12 " 14 " "	2	30.00	34.00	38.00	35.00	42.75	40.00	37.33	33.00	51.38	40.00	36.00	32.00	35.00	36.00	38.00	50.00	36.00	46.00	40.00
8-in. drop connections	28	3.00	3.25	2.00	3.50	1.25	1.25	3.33	3.00	2.00	1.75	1.50	1.00	3.00	1.25	2.00	2.50	1.00	1.75	3.00
Lampholes,	179	5.00	6.25	8.00	7.50	6.00	6.00	5.64	9.00	8.00	14.00	7.00	7.50	6.50	8.00	7.00	5.75	7.50	6.75	6.00
150-gal. flushtanks, "Rhds-Wims"	23	90.00	75.00	70.00	70.00	62.00	79.50	72.00	55.00	70.00	76.00	70.00	70.00	57.00	69.50	65.00	75.00	50.00	84.00	50.00
" " "Miller"	23	90.00	70.00	67.00	65.00	62.00	75.00	72.00	53.00	63.00	70.00	70.00	70.00	57.00	69.50	65.00	69.00	50.00	84.00	50.00
" " "VnVrankn"	22	90.00	75.00	70.00	65.00	62.00	72.00	70.00	53.00	63.00	69.00	70.00	70.00	58.00	69.50	63.75	67.75	50.00	84.00	48.00
Y-branches, 24-in. sewers	40	2.75	2.25	2.45	2.30	2.75	2.50	3.05	2.30	2.35	2.00	2.50	2.50	3.00	2.18	2.40	3.21	1.00	2.64	3.00
" 12-in. "	80	.75	.65	.72	.60	.60	.60	.81	.61	.66	1.00	.55	.75	1.00	.35	.65	1.20	1.00	.70	.60
" 10-in. "	263	.60	.45	.57	.67	.44	.50	.62	.57	.52	.90	.35	.50	.60	.28	.50	.52	1.00	.53	.50
" 8-in. "	3,758	.45	.35	.43	.32	.36	.38	.43	.33	.37	.80	.25	.35	.40	.26	.35	.39	1.00	.36	.35
Extension connections	875	.50	1.00	1.25	1.00	1.30	1.50	.67	1.50	1.25	1.50	.90	1.25	1.00	1.25	1.25	1.25	1.50	1.00	1.00
3-in. underdrains	1,395	.25	.35	.06	.10	.06	.07	.06	.30	.08	.20	.07	.10	.20	.10	.10	.10	.05	.07	.07
4-in. "	2,380	.30	.40	.09	.12	.08	.08	.08	.35	.12	.22	.09	.15	.25	.10	.11	.10	.07	.075	.10
6-in. "	1,960	.40	.50	.18	.15	.13	.26	.12	1.00	.25	.26	.13	.20	.30	.15	.20	.15	.10	.15	.13
Total		$54,324	$57,072	$54,824	$51,811	$50,032	$49,244	$43,315	$56,093	$58,824	$66,867	$41,828	$47,145	$58,330	$58,769	$49,318	$48,623	$74,075	$51,382	$46,097

MERIDIAN, MISS.—An election will be held April 24 and 25 to vote on a proposition to issue $105,000 in bonds for paving and sidewalk improvements. E. H. Dial, Mayor.

CLEVELAND, O.—The council received the following bids on March 25 for paving Brownell and St. Clair Sts. and East Madison Ave., respectively:

L. & J. F. Brennan	$22,768	$46,429	$44,035
M. F. Bramley	23,159	47,698	44,250
N. O. Paving & Const'n Co.	23,034	47,190	44,353
Shields & Lauer	24,184	49,388	45,545
R. P. Burnett	23,563	50,054	45,732
Albion Stone Co.	24,084	48,621	45,672

CLEVELAND, O.—Bids are asked until May 1 for paving four streets with dressed block Medina sandstone, and one street with asphalt. J. H. Farley, Dir. Pub. Wks.

ELYRIA, O.—C. H. Snow, Cy. Engr., writes us that the city will be ready in about four weeks to award contracts for 8,200 sq. yds. of brick or asphalt paving, estimated to cost $12,000.

MARION, O.—Bids are asked until April 6 for constructing stone sidewalks on several streets. James Williams, Cy. Clk.——Kelly & Co. have been awarded the contract for paving State St., at $41,595. A. O. Jones, of Zanesville, has the contract for furnishing the brick.

MEDINA, O.—Bids are asked until April 22 for paving a portion of Court St. H Goodwin, Clk.

NEWARK, O.—Bids are asked until April 6 for paving 5,000 sq. yds. with Belgian blocks, estimated to cost $5,240.

PLEASANT RIDGE, O.—Bids are asked until April 30 for the purchase of $9,700 of 6% street improvement bonds. R. T. Hutton, Clk.

INDIANAPOLIS, IND.—The city engineer has been directed to prepare plans for paving one street with brick. The bids received March 30 for asphalt paving were all rejected.——Plans have been ordered for

SEWERS.—Newark, N. J.—Ernest Adams writes us that the following bids were received March 28 for constructing two pipe sewers:

South Eleventh St.; average cut, 11 ft.:

	15-in., 1,360 ft.	12-in., 1,000 ft.	Manholes, 15.	Basins, 5.
*Headley & Christie	$0.92	$0.69	$33	$90
John Hunkele	.95	.68	34	98
P. H. Harrison	1.00	.75	30	90
W. Hanna & Co.	1.11	.68	35	100
Wm. J. Hughes	1.25	.80	35	100
Thomas A. O'Connor	1.28	.80	35	99
Michael Condon	1.25	1.15	30	90
James Maguire	1.50	1.20	38	110
Nicholas Caiso	1.25	1.10	30	125

Myrtle Ave.; average cut, 10 ft.:

	10-in., 810 ft.	Manholes, 4.
*P. H. Harrison	$0.40	$25.00
Wm. Hanna & Co.	.47	25.00
John Hunkele	.51	32.00
Wm. J. Hughes	.50	30.00
Thomas A. O'Connor	.53	30.00
Michael Condon	.55	28.00
Headley & Son	.58	33.00
James Maguire	.75	30.00
Nicholas Caiso	.85	25.00

* Awarded contracts.

ARTESIAN WELL.—South Bend, Ind.—The following bids were received March 23 for sinking from 5 to 30 6 to 8-in. wells about 100 ft. deep:

	Per ft.	Total.
American Well Works, Aurora, Ill.	$2.35½	$7,065
Gray Bros., Chicago	2.50	7,500
Cook Well Co., St. Louis, Mo.	2.88	8,640
Wagner Water Supply Co., Dayton, O.	3.07½	9,225
J. W. Pearl, Benton Harbor, Mich.	3.90	11,700

PIPE, VALVES, ETC.—St. Louis, Mo.—The following lowest bids were received March 26: For 3,527 tons of

catch basin inlets and four inlets to Pogue's Run. The other bids were as follows: On Wabash brick or block, standard, Watkins & Dalton, Anderson, $7.68; Frey & Eaton, Lafayette, $6.50; Jas. W. Wilding & Co., $6.90; Daniel Foley, $7.14; Browder & Shover, $6.49; F. M. Snyder & Co., $6.69; Mansfield & Allen, $6.52. Repressed, Capitol Paving & Construction Co., $6.11; Mansfield & Allen, $6.99. On Lafayette brick, Mansfield & Allen, $7.22. On Canton block, Wilding, $7.12. On New Albany (Hoosier) brick, Wilding, $7.12; Snyder, $7.19. On Clinton standard, Capitol, $6.14; Browder, $6.45; Fulmer-Seibert Co., $6.53; Snyder, $6.69. Repressed, Capitol, $6.24. On Indiana paving brick or block, Indiana Paving Brick Co., $6; Snyder, $6.69. On St. Louis repressed brick, Mansfield & Allen, $7.02. All are on stratified curb with Portland cement filler. Oolitic curb was the same or 4 to 18 cts. less, and granite curb 30 to 50 cts. more. Murphy grout and asphalt fillers were bid upon at prices 10 to 18 cts. higher.

ASPHALT PAVING REPAIRS.—Buffalo, N. Y.—We are informed that the following bids were received for repairing all asphalt pavements in the city needing repairs during 1895:

	Barber Asp. Paving Co.	German Rock. Asp. & Cem. Co.
Resurfacing, per sq. yd.	$1.49	$1.53
Skimming	.99	1.04
Replacing concrete and removing asphalt surface	2.87	2.35
Scraping joints and coating gutters, 12 ins. wide	.04	.05
Cleaning out cracks	.02	.03
Replacing stone along st. ry. tracks.	.19	.25

WATER-WORKS.—Hanover, Kan.—A. A. Richardson, Engr., Lincoln, writes us that bids were opened March 25 for constructing water-works at this place, and the following contracts were awarded: Geo. Garber & Sons, Hanover, Kan., stand-pipe base and wall, 12 × 40 ft., $1,771; Fremont Foundry & Machine Co.,

Fremont, Neb., stand-pipe, 12×85 ft., $2,025; U. S. Water & Steam Supply Co., Kansas City, 40-HP. boiler and feed pump, $483; U. S. Water & Steam Supply Co., Kansas City, Knowles duplex pump, 14×7×12 ins., $498; Hippley & Detrick Supply Co., St. Louis, valves and boxes, $274; Tamaqua Mfg. Co., Tamaqua, Pa., 30 hydrants, at $27; Shickel, Harrison & Howard Iron Co., pipe, per ton, cast iron pipe, $24.15; specials, $30. The city will lay the pipe and set machinery, etc.

GRANITE CURBING.—Holyoke, Mass.—We are informed that the following bids were received March 19 for a supply of granite curbing 18 ins. deep and 6 ins. thick, 600 ft. to be delivered each week:

	—Per lin. ft.— Curb.	Corners.
John Frawley, Erving (aw'd contract)	$0.46	$0.90
Webb Construction Co., Worcester	0.50	1.00
G. O'Connor, Fitchburg	0.47½	0.95
W. M. Flynt, Monson	0.49	0.98
G. E. Lyon	0.52	1.00
Whitmore Granite Co.	0.50	1.10
Davis & Bailey	0.52	1.04

BRICK PAVING.—Zanesville, O.—W. M. Shinnick, Jr., Cy. Clk., writes us that contracts for 50,000 sq. yds. of brick paving have been awarded to the T. B. Townsend Brick & Constructing Co., at 68 cts. per sq. yd. for one street and 70 cts. for six streets.

DREDGING.—Brooklyn, N. Y.—The following bids were received March 27 for dredging Gowanus Canal: R. G. Packard, work complete, $7,750; Sec. 1, $800; Sec. 2, $1,100; Sec. 3, $1,375; Sec. 4, $1,475; Sec. 5, $1,525; Sec. 6, $1,475; excavation, per cu. yd. (scow measurement), 20 cts. Henry E. DuBois, Jr., work complete, $7,527; Sec. 1, $714; Sec. 2, $1,080; Sec. 3, $1,398; Sec. 4, $1,440; Sec. 5, $1,485; Sec. 6, $1,440; excavation, per cu. yd., 18 cts.

SEWERS.—Hamilton, O.—J. J. McMaken, Cy. Clk., writes us that the following bids were received March 19 for constructing a sewer in sanitary sewer district No. 1; contract No. 5:

Bids Received at Hamilton, O., March 19, for Constructing a Sewer.

Quantities.	Walker & Robinson.	Wilson & Strack.	W. H. Louthan.	Ulrick, Nissley & Williams.	Duemer & James.	Bartow & Clements.	Greenv'le Constn Co.	Fries, Barr & Co.	Mansfield & Allen.	W. B. Boaz.
8-in. pipe, 6,900 ft., at	$0.12	$0.13	$0.20	$0.15	$0.12	$0.12	$0.25	$0.17	$0.19	$0.13
6 to 8 ft. deep, 500 " "	.20	.25	.15	.20	.12	.25	.14	.50	.165	.12
8 to 10 ft. " 6,200 " "	.34	.35	.19	.25	.31	.35	.19	.60	.27	.19
10 to 12 ft. " 100 " "	.48	.55	.30	.50	.41	.70	.25	.75	.33	.22
12 to 14 ft. " 100 " "	.58	.75	.40	1.00	.50	.80	.38	.90	.38	.30
Manholes, 2, "	28.00	30.00	25.00	30.00	33.00	28.00	30.00	40.00	26.19	25.00
Lampholes, 40, "	4.00	3.50	2.50	5.00	1.20	3.00	3.00	3.00	3.26	2.00
Flushtanks, 18, "	40.00	35.00	25.00	60.00	41.00	28.00	35.00	45.00	30.29	25.00
Lead pipe:										
Without trenching, 50 ft. "	.15	.25	.20	.05	.56	.15	.40	.25	.225	.16
With trenching, 200 " "	.26	.35	.25	.20	.23	.24	.50	.35	.32	.22
Corp. cocks, etc., 18 "	2.00	3.00	3.00	2.00	3.00	3.00	4.00	4.00	4.72	3.25
Lumber, 10 M. ft. "	20.00	10.00	5.00	20.00	.01	1.00	2.00	20.00	.....	15.00
Total	$4,373	$4,388	$3,467	$4,453	$3,881	$4,072	$4,058	$6,672	$4,027	$3,027

BRICK PAVING.—Newark, O.—The bids recently received for paving with brick range from 75 cts. to $1.10 per sq. yd. It is stated that the contract, amounting to about 17,000 sq. yds., will be awarded to Brennan & Nutter, of Newark.

MISCELLANEOUS CONTRACTS AND SUPPLIES.

DREDGING.—Wilmington, Del.—Bids are asked until April 29 for dredging in six rivers. W. F. Smith, U. S. Agent.

STREET LAMPS.—New York, N. Y.—Bids are asked by the department of public works until April 16 for furnishing 1,500 street lamps.

DREDGING.—San Francisco, Cal.—Bids are asked until April 18 for dredging in Petaluma Creek. Maj. W. H. Heuer, U. S. Engr. Office.

STEAM ROAD ROLLER.—Chicopee, Mass.—The council has authorized the purchase of a steam road roller, at a cost not to exceed $3,200.

CHEMICAL ENGINES.—Boston, Mass.—Bids are asked until April 12 for two 50-gallon double tank chemical engines. Robert G. Fitch, Chn. Fire Comrs.

SMOKELESS POWDER.—Washington, D. C.—Bids are asked until May 15 for 20,000 lbs. of smokeless powder. Brig.-Gen. D. W. Flagler, Ch. of Ordnance.

STREET SPRINKLING.—Winton Place, O.—Bids are asked until April 11 for sprinkling the streets of this village. E. F. Layman, Village Engr., 64 West 3d St., Cincinnati.

CEMENT, STONE, ETC.—Mobile, Ala.—Bids are asked until April 30 for furnishing cement, broken brick, etc., as stated in our advertising columns. Maj. A. N. Damrell, U. S. Engr. Office.

RETAINING WALL AND PAINTING.—Milwaukee, Wis.—Bids are asked by the park commissioners, Hathway Bldg., until April 9, for building a retaining wall in Lake Park; also for painting two bridges.

LUMBER.—Philadelphia, Pa.—Bids are asked until April 12 for furnishing and delivering lumber at Fort Delaware, as stated in our advertising columns. Second Lieut. Spencer Crosby, U. S. Engr. Office.

PINE LUMBER.—St. Louis, Mo.—Bids are asked until April 19 for furnishing and delivering long leaf yellow pine lumber at Ewing Station, Mo. Lieut.-Col. Charles R. Suter, Engr. Missouri River Comn.

TELEPHONE INSTALLATION.—Washington, D. C.—Bids are asked until April 10 for furnishing material and labor for installing a departmental telephone system in the Department of Justice building. Richard Olney, Attorney General.

HARBOR WORK, ETC.—Mobile, Ala.—Bids are asked until April 30 for furnishing a plant, crew and labor complete for keeping channel of Mobile River and Harbor clear of timber and other obstructions for two years. Maj. A. N. Damrell, U. S. Engr. Office.

BREAKWATER, ETC.—Albany, N. Y.—The governor has signed a bill appropriating $15,000 for repairing the breakwater at the foot of Seneca Lake; also a bill appropriating $25,000 for repairing the North Branch reservoir in Wilmurt township, Herkimer county.

DREDGING, ETC.—Chicago, Ill.—Bids are asked by the South Park Commissioners, Refrectory Bldg., Washington Park, until April 10, for the following work: 100,000 cu. yds. of dredging, 54,000 sq. ft. of concrete sidewalk, 10,000 sq. yds. of sod, constructing a stone bridge, and furnishing 20 boats.

TELEPHONE FRANCHISES.—Eau Claire, Wis.—The council, on March 30, granted a telephone franchise to George W. Hudleston and others, telephones to be furnished business offices at $36 a year and residences at $24. The new company will be in competition with the present company. C. A. Alderman, Cy. Engr.

Rossville, Ill.—A telephone franchise has been granted to F. L. Stewart. S. M. McGuire, Village. Clk.

INDUSTRIAL NOTES.

THE BLOOMSBURG CAR MFG. CO., of Bloomsburg, Pa., has a large order for flat cars for a Mexican railway.

THE ILLINOIS STEEL CO., of Chicago, Ill., has the contract for steel rails for 159 miles of the Trinity, Cameron & Western Ry.

THE UNION CAR CO., of Depew, N. Y., is delivering 200 coal cars of 65,000 lbs. capacity to the Buffalo, Rochester & Pittsburg R. R.

THE PENNSYLVANIA STEEL CO., of Steelton, Pa., has the contract for the iron work for the first section of the Boston subway.

THE BUCYRUS STEAM SHOVEL & DREDGE CO., of South Milwaukee, Wis., has the contract for a harbor dredge for Superior, Wis.

THE MISSOURI VALLEY BRIDGE CO., of Leavenworth, Kan., has completed the bridge over the South Canadian River at El Reno, Okla.

BYRAM & CO., Detroit, Mich., has recently shipped to the Utica (N. Y.) Foundry Co. an 80-in. furnace, and reports a number of other orders on hand.

ANGUS & GINDELE, Security Bldg., Chicago, have been awarded the contract for putting in the foundation for the Northwestern Elevated R. R., Chicago.

THE BETHLEHEM IRON WORKS, of South Bethlehem, Pa., has an order for 70-lb. rails for the Atlanta & West Point Ry., and 63-lb. rails for the Western Ry. of Alabama, making 25 miles in all.

THE DETROIT GRAPHITE MFG. CO., of Detroit, Mich., has had its paint specified for use on all the iron work to be used in the new Astor hotel, New York. Several orders for export trade have recently been received.

THE HEINE SAFETY BOILER CO., of St. Louis, Mo., has been awarded the contract for furnishing boilers to Lindon W. Bates, of Chicago, for the large dredging boats he is now building for the government for use on the Mississippi River.

THE WILLIAMS PALACE SLEEPING CAR CO., of Kansas City, Mo., has been organized by "Eastern capitalists," with a capital stock of $5,000,000, to manufacture a car with collapsible mattresses and berths which are filled out with air at night.

THE LACKAWANNA IRON & STEEL WORKS, of Scranton, Pa., have an order, through John F. Merrill, of San Francisco, Cal., for 10,000 tons of steel rails for the San Francisco & San Joaquin Valley Ry., of which W. B. Storey, Jr., is chief engineer.

A. J. DU PUIS, of Detroit, Mich., is building a 1,300-ft. dock and roadway at Mt. Clemens, Mich., for the Mt. Clemens & Lakeside Electric Street Ry. & Dock Co., and also has the contract for putting in the foundations for a large apartment house on Jefferson Ave., Detroit.

THE ELIZABETHPORT TIN PLATE CO., of Elizabethport, N. J., has been organized, and will establish its plant in the old works of the Morewood Tin Plate Co. Black plates will be manufactured, four mills put in, and a 1,000-HP. engine will run the plant. Gen. Man., H. Pritchard. Capital stock, $150,000.

THE RICHMOND LOCOMOTIVE WORKS, of Richmond, Va., has an order for 12 passenger and freight engines for the Seaboard Air Line. The passenger engines will have 68-in. driving wheels, and cylinders 19×24 ins.; the freight engines will have 57-in. driving wheels, and cylinders 19×24 ins.

THE BERLIN IRON BRIDGE CO., of East Berlin, Conn., has designed and built a new retort house for the Collins Co., at Collinsville, Conn., and has also the contract for the new Capitol Ave. bridge at Hartford, Conn., which will consist of two 82-ft. plate girder spans, with a 25-ft. roadway and two sidewalks.

THE HEATH RAIL JOINT CO., of Chicago, has recently been awarded the contract for furnishing its joint for 60 miles of track on the Atchison, Topeka & Santa Fe R. R. and for 15 miles of track on the Gulf, Colorado & Santa Fe R. R. This joint was illustrated and described in Eng. News, Jan. 3, 1895, and is said to be in use on over 50 railways.

THE NATIONAL SWITCH & SIGNAL CO., of Easton, Pa., has been awarded the contract for erecting the first interlocking plant for the Baltimore tunnel. The machine will consist of 24 active levers, and is to be completed and ready for service by April 1. The company states that it has been running its work continuously day and night for the past months, and will continue to do so for the present.

THE STUPP BROS. BRIDGE & IRON CO., of St. Louis, Mo., has recently been awarded the contract for four 200-ft. spans to be built and erected in Louisa Co., Ia. Plans for this bridge were prepared by G. W. Wynn, C. E., of Cedar Rapids, Ia. This company is putting in machinery for operating its entire plant by electricity, the motors being furnished by the General Electric Co. Mr. O. W. Childs is the company's engineer.

THE WARNERS PORTLAND CEMENT MFG. CO.'S works, at Warners, N. Y., is to be sold at public auction April 15. The company owns about 51 acres of marl and clay land, furnishing the raw material for the manufacture of cement, and machinery, buildings and tools, subject, however, to a mortgage of $75,000. An upset price of $25,000 has been fixed. Mr. Geo. G. Cotton, 23 Everson Building, Syracuse, N. Y., from whom further information can be obtained, is the Receiver.

J. H. GRAY, C. E., New York Life Building, Chicago, patentee of the Gray column, informs us that his column is to be used in the following structures: Guarantee and Ellicott Square buildings, Buffalo, N. Y.; Lafayette Square theatre, Washington, D. C., and Hotel Metropole, Philadelphia, Pa. It has been used in a number of other large buildings, already completed, and has been specified for use in the J. N. Brown office building, Duluth, Minn.; Mabley building, Detroit, Mich., and the new court house at Rock Island, Ill.

THE GILLETTE-HERZOG MFG. CO., of Minneapolis, Minn., contractors for bridges, structural iron work, etc., reports among other contracts recently completed the following: Iron work for the Hennen Building and Annex, and Cora Building, New Orleans, La.; six 110-ft. trusses for the Southern Pacific Ry. at Algiers, La.; steel viaduct at Stillwater, Minn.; four 120-ft. combination highway spans at Palmer, Idaho; the new Library Building for the University of Minnesota, Minneapolis, Minn.; 16×140 ft. water-works stand-pipe at Alexandria, La., and a number of general buildings for manufacturing purposes. It is now completing the contract for the roof of the new Court House at Minneapolis. Chf. Engr., Frank J. Llewellyn.

THE WESTERN FILTER CO., of St. Louis, Mo., has removed its offices to the Union Trust Bldg. It is now building a 500,000-gallon filter plant for the Murphysboro, Ill., water-works; a complete filtering plant for the Ferd. Heim Brewing Co., of Kansas City, Mo., and a 100,000-gallon per day plant for the Green Tree Brewing Co., of St. Louis, Mo. It has recently furnished the new Chain of Rocks pumping station for the St. Louis water-works with two filters. This company has furnished filtering plants for several water-works systems, has equipped about 20 breweries with filtering plants, and has over 500 filters in use in St. Louis. It is placing the Acme natural stone germ-proof house water filter on the market, with a daily capacity of 30 to 50 gallons, at a cost of $20 each, and reports the use of them as becoming very general in St. Louis and other cities. Pres., Powell Jackson; Secy. and Treas., Geo. D. Hodkinson.

ADVERTISEMENTS.

NOTICE TO CONTRACTORS.

VILLAGE OF HASTINGS-ON-HUDSON, WESTCHESTER COUNTY, N. Y.

OFFICE OF THE BOARD OF SEWER COMMISSIONERS.

Sealed proposals, endorsed "Proposals for Constructing a System of Sewers for the Village of Hastings-on-Hudson," with the name of the person or persons making the same, and addressed to the Board of Sewer Commissioners of the village of Hastings-on-Hudson, will be received at the office of said Board until 3 o'clock p. m. of Thursday, the 18th day of April, 1895.

Plans may be inspected, and copies of the specifications, contract and form of proposal may be obtained at the office of the Board, at the corner of Main and Constant streets in said village.

THOMAS K. FRASER, President of the Board.
PETER A. HAYES, Clerk.

HASTINGS-ON-HUDSON, March 27, 1895. 14-2t

SEWERS, WILLIAMSPORT, PA.

Sealed proposals will be received by the city of Williamsport, Pa., until 12 o'clock noon of April 18, 1895, for the construction of the following sewers: 2,100 ft. of 20-in. pipe sewer, 3,715 ft. of 18-in. pipe sewer, 1,520 ft. of 12-in. pipe sewer, 7,500 ft. of 10-in. pipe sewer, 3,775 ft. of 8-in. pipe sewer, 45 manholes, 5 flush tanks and 5 lamp holes. Bids must be accompanied by a certified check for 10 per cent. of the amounts bid. Plans can be seen and specifications and blank proposals can be procured at the office of the City Engineer, City Hall, Williamsport. The city reserves the right to reject any or all bids.

J. J. GALBRAITH, City Clerk.

Williamsport, Pa, April 2, 1895. 14-2t